ROMANIAN ACADEMY

ROMANIAN NATIONAL COMMITTEE
OF GEODESY AND GEOPHYSICS

NATIONAL REPORT

ON GEODETIC AND GEOPHYSICAL ACTIVITIES IN ROMANIA

2011 – 2014

Prepared for the XXVIth IUGG General Assembly
PRAGA - CZECH REPUBLIC
22 June - 2 July 2015

Bucharest
2015

FOREWORD

The National Report of the Romanian Committee of Geodesy and Geophysics (RNCGG) prepared for the XXVI-th General Assembly of IUGG aims at presenting the main directions and results of newly initiated and/or developed scientific researches of Romanian geoscientists, corresponding to the component associations, regarding the interdisciplinary study of the planet Earth.

In the framework of this volume, each section of the RNCGG has displayed, under the guidance of the national correspondents, the involvement of Romanian scientists and specialists in major national and international research projects, the organization of significant conferences and symposia, as well as the main topics discussed by the Romanian participants.

A selective bibliography is presented as an important part of every contribution within the National Report, allowing to those interested to continuously follow the development of the research projects as well as the involved working groups, in view of establishing contacts that we hope will prove to be mutually profitable in the next future.

This report, conceived as an ensemble that allows the interested reader to get an accurate image upon the activity in geodesy and geophysics in Romania, includes the interval 2011-2015, since the last IUGG General Assembly held in Melbourne, Australia.

The possibility of presenting a quite comprehensive volume is a consequence of the continuous improvements in the organizational policy of the RNCGG, by appointing new members and secretaries of the associations' committees. Significant efforts and dedicated work have been provided by Dr. Constantin Stefan Sava, RNCGG Secretary General and by all the associate editors. Their most important contribution is acknowledged and thanked.

The National Report represents also a homage to our dear professors and former presidents of the Romanian National Committee of Geodesy and Geophysics, founders of the Romanian school of geophysics, Acad. Sabba S. Stefanescu and Acad. Liviu Constantinescu.

Prof. Dr. Dorel ZUGRAVESCU
Corresponding Member of the Romanian Academy

ROMANIAN ACADEMY
ROMANIAN NATIONAL COMMITTEE OF GEODESY AND GEOPHYSICS

Secretariat: PO Box 72-145
033270 Bucharest
ROMANIA

Phone: +40-722-786 434
Fax: +40-21-252 2594
Email: savac@geoecomar.ro

NATIONAL COMMITTEE:

President: **Dorel ZUGRAVESCU**, Corresponding Member of the Romanian Academy
dorezugr@geodin.ro

Vicepresident: **Crisan DEMETRESCU,** Corresponding Member of the Romanian Academy
crisan@geodin.ro

Secretary General: **Constantin Stefan SAVA** savac@geoecomar.ro

NATIONAL CORRESPONDENTS:

IACS: **Roxana BOJARIU**	bojariu@meteoromania.ro
IAG: **Johann NEUNER**	neuner@geodezie.utcb.ro
IAGA: **Andrei SOARE**	andisol@digi.ro
Venera DOBRICA	venera@geodin.ro
IAHS: **Mary-Jeanne ADLER**	mj.adler@hidro.ro
IAMAS: **Gheorghe STANCALIE**	gheorghe.stancalie@meteoromania.ro
Sabina STEFAN	sabina_stefan@yahoo.com
IAPSO: **Nicolae PANIN**	panin@geoecomar.ro
IASPEI: **Mircea Radulian**	mircea@infp.ro
IAVCEI: **Alexandru SZAKACS**	szakacs@sapientia.ro

NATIONAL REPORT

Co-ordinator: **Constantin Stefan SAVA**

Editors:

IACS: **Roxana BOJARIU**	IAMAS: **Sorin BURCEA**
IAG: **Tiberiu RUS**	IAPSO: **Florin DUTU**
IAGA: **Anca ISAC, Sorin RADAN**	IASPEI: **Iren Adelina MOLDOVAN**
IAHS: **Mary-Jeanne ADLER**	IAVCEI: **Alexandru SZAKACS**

I A C S   ACTIVITIES IN ROMANIA

2011 - 2014

NATIONAL REPORT ON CRYOSPHERIC SCIENCES

IACS RELATED ACTIVITIES IN ROMANIA
2011-2014

Romanian IACS Committee

National Correspondent:
Dr. RoxanaBojariu [1)] bojariu@meteoromania.ro

Members:

Prof. Dr. Petru Urdea[2)] petru.urdea@e-uvt.ro

Dr. Andrei Diamandi[1)] diamandi@meteoromania.ro

Secretary:
Dr. Alexandru Onaca[2)] alexandru.onaca@e-uvt.ro

1) National Meteorological Administration
Sos. Bucureşti-Ploieşti 97
013686, Bucharest, Romania
Tel: +402131621140; Fax: +40213163143

2) West University of Timișoara
4 Vasile Pârvan Blvd, Timişoara, Romania
Tel:0040 256 592332

FOREWORD

The present report describes the activities carried out in Romania in the Cryosphere Section of the National Romanian Committee of Geodesy and Geophysics in the period 2011-2014. The main domains represented within the Cryosphere Section are: (1) Snow and Avalanches; (2) Continental Glaciers and Permafrost; (3) Cryosphere, Atmosphere and Climate. The *Snow and Avalanches* issues covered by Romanian scientists consist of:

- monitoring snow cover and assessing avalanche risk in Romania using in-situ measurements, satellite data and model results.

In the field of the *Continental Glaciers and Permafrost* the most significant results recently reported by Romanian researchers focus on:

- permafrost detection in the Southern Carpathians;
- studies of Scărișoara Ice Cave from the Apuseni Mountains in Romania.

Recent results of Romanian scientist regarding the *Cryosphere, Atmosphere and Climate* cover the topics:

- updated analysis of observed snow cover variability and change for the Romanian territory;
- future projections of snow depth over Romania under the RCP 4.5 and RCP 8.5 scenarios.

The Romanian community of cryosphere sciences has two more organizations to exchange information, ideas and data within it and with the international community. The Romanian National Commission for Antarctic Research (RNCAR) was established under the coordination of Romanian Academy in 2012 (http://www.acad.ro/comisiiAR/Comisia-CNCA/comisii_CNCA_cnt.htm). RNCAR has a section of Physical Sciences in which cryosphere research has been included. Also, the Association of Polar Early Career Scientists in Romania (http://apecs.asce.ro/) has been active since 2013.

PART I: Snow and Avalanches

The monitoring of snow cover evolution in the mountain area of Romania contributes to the protection of lives, properties and infrastructure. Avalanche risk has been identified in the Romanian mountains and risk assessment studies are continuously updated. The program of snow-related meteorology which started in the National Meteorological Administration in February 2004 (under the coordination of "Centre d'Etudes de la Neige", Grenoble) has been carried out to meet the demand for information related to snow cover avalanche conditions. The National Meteorological Administration (http://www.meteoromania.ro) through the Regional Forecasting Center in Sibiu, the Department of Geography of the West University of Timișoara and the Faculty of Geography from the University of Bucharest are the leading institutions in the avalanche monitoring and research.

Snow avalanches change landscapes and frequently disturb forest stands. Such disturbances in trees have been used to date past avalanches, study their extent and document their triggers by the dendrogeomorphological approach. The dendrogeomorphological approach combined with snow-related analysis using meteorological data have provided the tools to reconstruct past avalanche activity (from 1963 to 2011) in the Bucegi Mountains in the Southern Carpathians (Voiculescu and Onaca, 2013; Voiculescu and Onaca, 2014). The same approach was used to identify past avalanches (from 1852 to 2013) in the Arpaș Valley from the Făgăraș Mountains in the Southern Carpathians (Chiroiu et al., 2015). In March 2005, a series of snow avalanches occurred in the Făgăraş Massif, affecting especially forestlands and roads. Voiculescu and Ardelean (2012) analyzed these events produced in the Doamnei glacial valley using the terrain data, climate variables, geomorphic and vegetative indicators. Past avalanches analysis provides the knowledge to document the hazard component of the avalanche risk. Studies regarding avalanche-related impact components and risk assessments have been also carried out for tourist areas. In the Southern Carpathians, the impacts and risks have been assessed for places such as the Sâmbăta Valley (Petre et al, 2012) and the Piatra Craiului Massif (Munteanu et al, 2011; Munteanu et al, 2013). Covăsnianu (2011) assessed the avalanche risk using GIS techniques in the Ceahlău area from the Eastern Carpathians.

PART II: Continental Glaciers and Permafrost

In the last years, several activities carried out by Romanian scientists focused on glacial/periglacial geomorphology and permafrost detection. The team of West University of Timisoara, Department of Geography, coordinated by Professor Petru Urdea has contributed to Data and Information Service for CliC (http://clic.npolar.no/). Several studies used combined physical and geomorphological approach to detect and characterize the permafrost presence in the mountain areas in Romania. Vespremeanu-Stroe et al (2012) used direct resistivity profiles, temperature measurements and surface morphological analysis to found the lower altitudinal limits for permafrost occurrence and the activity of rock glaciers (RGs) in the Retezat Mountains (Southern Carpathian). The limit which was identified for the permafrost occurrence is at 2000 m altitude. In this case, the two highest and most active RGs are younger than 8 ka and developed following a cold climate event at 8.2 ka, while the remaining RGs formed around 11.5–8.7 ka (Vespremeanu-Stroe et al, 2012). Using geoelectrical soundings, Onaca et al (2013a) have found ice content in the upper portion of the Pietroasa, Ieşu and Pietrele RGs (Southern Carpathians) at above 2040 m. Monitored ground surface temperatures (GSTs) add extra credence to the existence of permafrost in the Pietroasa RG. In the Ieşu and Pietrele RGs, measurements of bottom temperatures of the winter snow cover (BTS) were performed in March 2012. Considering the thick active layer, the reduced ice content and the presence of scarce vegetation on their surface it could be assumed that the permafrost exists in marginal conditions in the Southern Carpathians. The ground ice in detected permafrost is produced by the groundwater freezing or by snow banks buried by coarse angular boulders following large rockfalls (Onaca et al, 2013a). Another study which used results from the DC resistivity tomography for the detection of periglacial landforms structure has been performed for six locations in the alpine domain of Southern Carpathians (Onaca et al, 2013b). The electrical resistivity measurements indicated the presence of sediments cemented by ice and ice lenses in Roșiile RG (Onaca et al, 2013b). The large depth of the active layer and the low content of ice suggest that the permafrost exists in marginal condition and is not in equilibrium with the present climate (Onaca et al, 2013b). The distribution of permafrost in the central part of the Parâng Mountains was evaluated by means of geophysical (DC resistivity tomography) and thermal measurements (BTS and GST) (Popescu et al, 2015).

An important research area refers to the ice caves located in the Western Carpathians. The Carpathian Mountains across Slovakia and Romania are home of several ice caves located at elevations between 700 and 1200 m above sea level. Although the mean surface annual temperature is above the freezing point, perennial ice deposits are common in caves and shafts with certain morphologies (large entrances followed by steep vertical or downward-sloping passages), into which snow and ice accumulates in winter ad early spring, and it is being preserved by the cold microclimate it generates. Of these, Scărișoara Ice Cave (Romania), located in the Apuseni Mountains at 1165 m above sea level hosts one of world's largest and oldest underground glacier formed by the successive accumulation of layers built by the freezing of water accumulated mostly from late summer through early winter precipitation (Perșoiu, 2011; Perşoiu and Pazdur, 2011). The ice block in this cave preserves a large variety of candidate proxies for both past climate and environmental changes, the most significant ones being the stable isotopic composition of the ice (a proxy for air temperature) and pollen remains (Perșoiu, 2011; Feurdean et al, 2011). Feurdean et al (2011) presented evidence from the pollen extracted from the Scărișoara Ice Cave which suggests the prevalence of forest dominated by *Fagus sylvatica* between ca. AD 1200 and 1500 and by *Picea abies* between ca. AD 1000 and 1500 and from AD 1550 onwards. High amounts of micro- and macro-charcoal particles between AD 1600 and 1850, when climate conditions were cool and wet, suggests that the charcoal was washed into the cave during times of extreme rainfall events (Feurdean et al, 2011).

The 22 m long icecore extracted from the Ice Cave Scărişoara and analyzed by Perșoiu (2011) provided stable isotope data covering almost the entire Holocene, between 0.09 and 9.75 ka BP. The first order fluctuation broadly follows the orbitally induced Northern Hemisphere September insulation (Perșoiu, 2011), with a minimum in the early Holocene, a slow climb towards a maximum at about 5.0 ka, followed by a very slow cooling towards the present, accentuated after about 0.5 ka. Perșoiu (2011) identified a series of rapid cooling events (RCE) superimposed on the long-term variations, the most notable ones being at 9.5 ka, 8.2 ka, 7.9 ka, 6 ka, 4.2 ka, 3.2 ka and 0.9 ka. The data revealed by Perșoiu (2011) suggests that the trends of temperature changes in mainland Europe during the Holocene were mainly governed by changes in solar output. RCEs were synchronous with North Atlantic events originating from sea surface temperature changes and being amplified by atmospheric dynamics Perșoiu (2011). The stable isotope data presented by Perșoiu (2011) show in the last 2000 years four climatic events, attributed to the Roman Warm period (RWP), the Dark Ages Cold Period (DACP), Medieval Warm Period (MWP) and the Little Ice Age (LIA). The data suggests that air temperature was highly variable during the LIA and more stable during the warm MWP and RWP (Perșoiu, 2011). Under present climate conditions, Rîmbu et al (2012) documented the relationship between temperature variability inside Scărișoara Ice Cave and large-scale atmospheric circulation modulated by sea surface temperature (SST) anomalies. High (low) temperatures inside the cave are associated with high (low) air temperature over a large area that covers central and Eastern Europe. The corresponding atmospheric circulation patterns favor relatively warm (cold) air advection towards the cave region during high (low) temperatures inside the cave. A correlation analysis reveals that the atmospheric circulation patterns associated with cave temperature variability is mainly the result of the East Atlantic-Western Russia ($r = -0.38$) teleconnection pattern (Rimbu et al, 2012).

Hillebrand-Voiculescu et al (2015) have investigated the presence of microorganisms and their chronological distribution in the subterranean ice of Scărișoara Cave's in relationship with past climatic changes. The authors collected samples from ice layers of different age (from present to around 900 years BP). The chemical composition and organic content of both deeply buried (>10 m inside the ice block) and surface (supra- glacial pond water) habitats were analyzed in relation to their age and organic composition. This study is the first to report on the presence of both prokaryotic and eukaryotic microorganisms in the subterranean ice block of Scărișoara Ice Cave. These findings can be further used to reconstruct changes in the microbial diversity over the past 5000 years, in correlation with climatic and environmental changes recorded by the ice block (Hillebrand-Voiculescu et al, 2015).

Kern and Perşoiu (2013) draw the attention to the fact that cave-hosted ice bodies have been reported to be affected by significant mass loss worldwide, under climate change conditions. Their conclusion focused on the need to devote more scientific attention to the complex research of cave ice deposits before accelerated melt will determine the complete loss of the unique palaeoenvironmental information stored in these deposits (Kern and Perşoiu, 2013).

PART III: Cryosphere, Atmosphere and Climate

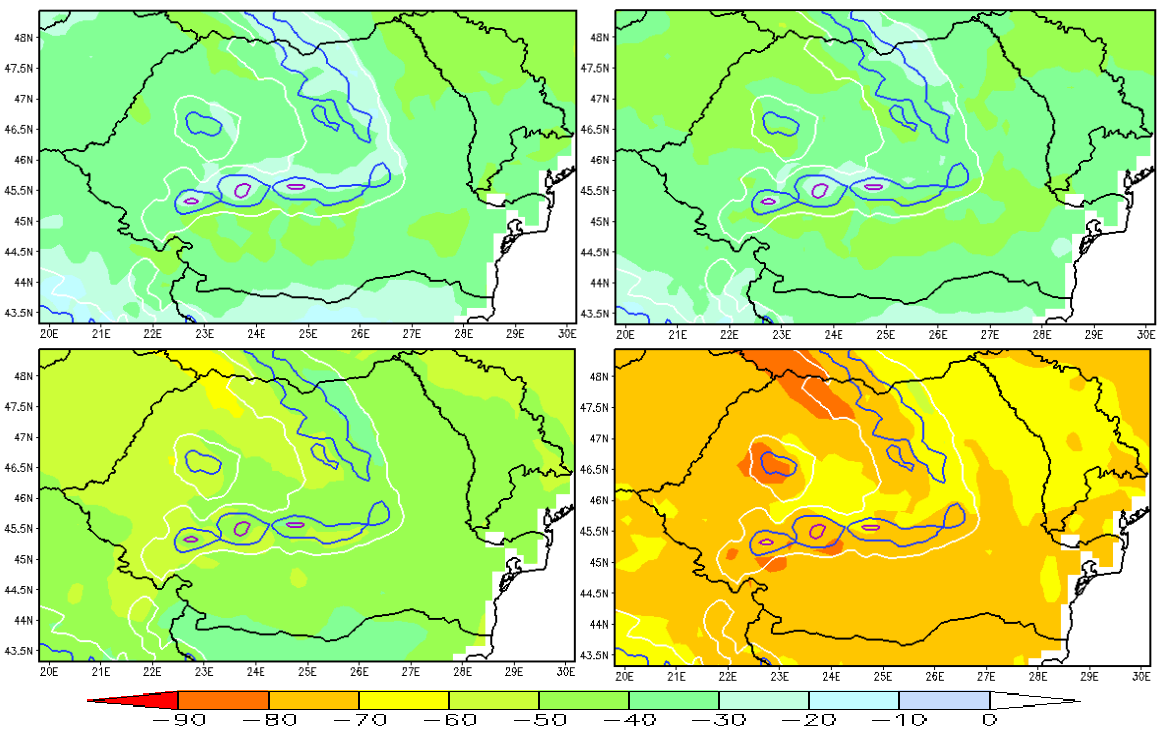


Figure 1 Ensemble mean of snow depth changes (in %) in Romania for the intervals 2021-2050 (upper panels) and 2070-2099 (bottom panels) under scenarios RCP 4.6 (left panels) and RCP 8.5 (right panels). The reference period of present climate is 1971-2000. Contour lines show model orography (white – above 500 m; blue – above 1000 m; magenta – above 1500 m). Regional climate models and their associated global driving models used to compute the ensemble mean are presented in table 1. From Bojariu et al. (2015).

The study of Bîrsan and Dumitrescu (2014) updated the past analyses of snow cover depth and number of days with snow cover. Their results reinforced the conclusion that while the snow variability is related to North Atlantic Oscillation, the observed snow trends are the local fingerprint of global warming. Numerical experiments with regional climate models have been used to investigate in more detail the physical mechanisms involved in regional response to present and future global warming (Bojariu et al, 2015). The analysis of future projection in snow depths (Figure 1) draw the attention to possible climate-change related impacts on snow in several Romanian regions and hence to the climate-change influences on related socio-economic activities.

Table 1. Global and regional climate models used in Figure 1 (from EuroCORDEX and CMIP5 results).

Nr.	Regional Modeling Centre	Regional Model	Global Model
1	CLMcom (CLMcom Consortium)	CLM 4-8-17	MPI-ESM-LR
2	DMI (Denmark)	HIRHAM5	ICHEC-EC-EARTH
3	IPSL-INERIS (France)	WRF 331F	IPSL-CM5A-MR
4	KNMI (Netherland)	RACMO 22E	ICHEC-EC-EARTH
5	MPI-CSC (Germany)	REMO 2009	MPI-ESM-LR
6	SMHI (Sweden)	RCA4	ICHEC-EC-EARTH

Participation of Romanian specialists in national and international projects or programmes related to cryosphere themes

International programs and projects

European FP7 "GMES Service for snow and land ice" (CryoLand)
Period: 2011-2015
Project manager of the Romanian team in the project: Dr. A. Diamandi (National Meteorological Administration, Bucharest, Romania)

CryoLand is a project carried out within the 7th Framework of the European Commission aimed at developing downstream services for monitoring seasonal snow, glaciers and lake/river ice primarily based on satellite remote sensing. The services target private and public users from a wide variety of application areas, and aimed to develop sustainable services after the project is completed (Malnes et al, 2015).

EEA Grant "Remote sensing, model and in-situ data fusion for snowpack parameters and related hazards in a climate change perspective" (Snowball)
Period: 2014-2017
Project manager: Dr. G. Stăncălie (National Meteorological Administration, Bucharest, Romania)

The Snowball project will deliver a prototype snow monitoring system that combines daily satellite data from Sentinel-1 and Sentinel-3 with in-situ weather station observations and state-of-the-art snowpack and climate modelling. Three important applications of snow monitoring will be demonstrated: hydrological modelling, snow-melt induced flash flood warning and snow avalanche warning. The project will also assess the impact of snow under present and future climate conditions on: flash flood statistics due to snow melt contributions, avalanche statistics and groundwater.

EEA Grant "Forest response to climate change predicted from multicentury climate proxy-records in the Carpathian region" (CLIMFOR)

Period: 2014-2017

Project manager: Dr. Cătălin Roibu, Ştefan cel Mare University, Suceava

The aim of the project is to answer one of the most critical questions in climate research: does the magnitude and rate of the 20th century climate change exceed the natural variability in the Carpathian region? As the instrumental records are limited to the past 100 years, it is necessary to obtain palaeoclimatic data from different sources, namely the so-called "proxies": tree rings (width, maximum density, stable isotopic composition of cellulose), perennial ice accumulations (ice layer thickness, stable isotopic composition of ice), lacustrine sediments (thickness of annual layers, embedded pollen etc). Thus, within CLIMFOR, we will supply high-resolution climate reconstructions that capture 1) the magnitude and rate of change of the climatic shifts and 2) the magnitude and frequency of extreme events, over the last 1000 years. By integrating palaeoclimatic data obtained through dendrochronologic, climatic, isotopic, glaciologic and sedimentologic methods we aim to obtain, for the first time in Romania, a precise and complex view of the climatic changes in the Carpathian region during the late-Holocene and Anthropocene periods.

Participation of Romanian specialists in the national and international symposiums and conferences

2012

Maggi, V., Turri, S., Bini, A., Perşoiu, A., Onac, B.P., Stenni, B., Udisti, R., Two millennia of natural to antropogenic effects in Transylvania from Focul Viu ice core. 5th international Workshop on Ice Caves (IWIC-V), Barzio, Italy, September 16-23, 2012.

Maggi, V., Turri, S., Bini, A., Perşoiu, A., Onac, B.P., Stenni, B., Udisti, R., Natural to anthropogenic effect in the last 2000 years of Focul Viu Ice Cave. From Glacier to Climate: Euro-Asian perspectives in cryospheric sciences, Beijing, China, July 9-10, 2012.

Micu, D.: Shifts during the snow season in the Romanian Carpathians in response to winter temperature and precipitation change. EGU General Assembly, Vienna, Austria, April 22-27, 2012

Perşoiu, A., Bojar, A.-V., δ13C in cave ice: a new proxy for palaeoprecipitation reconstructions. 5th international Workshop on Ice Caves (IWIC-V), Barzio, Italy, September 16-23, 2012.

Perşoiu, A., From speleothemes to glaciers: disentangling between karstic and glaciologic processes in caves. 20th International Karstological School, Postojna, Slovenia, June 18-22, 2012.

Perşoiu, A., Lauritzen, S.-E., Ice caves - a possible habitat for life on Mars. Workshop on Mars - Connecting Planetary Scientists in Europe, Budapest, Hungary, June 5-7, 2012.

Perşoiu, A., Onac, B.P., Blaauw, M., Wynn, J.G., Holmgren, K., A 10,500 year record of summer temperatures in Central Europe from cave glaciers. EGU General Assembly, Vienna, Austria, April 22-27, 2012.

Perşoiu, A., Bojar, A-V., Palaeoclimate signal recorded by stable isotopes in cave ice: a modeling approach. EGU General Assembly, Vienna, Austria, April 22-27, 2012.

Perşoiu, A., Monitoring climatic parameters and stable isotopic composition of water and ice in ice caves. 2nd International Cave Monitoring Workshop, Innsbruck, Austria, April, 19-21, 2012.

Perşoiu, A., Early Holocene rapid climatic changes recorded in cave ice (Romania, Central Europe).

3rd Intimate Workshop, De Lutte, the Netherlands, March 25-29, 2012.

Popescu, R., Urdea, P., Vespremeanu-Stroe, A., Onaca, A., Vasile, M., Permafrost occurence in cold scree slopes at low altitudes (Detunatele, Apuseni Mountains, Romania), TICOP, *Tenth. Intern Conf. on Permafrost*, Salekhard, 25-29 iunie 2012

Urdea, P., Onaca, A., Ardelean, F., Ardelean, M., Török-Oance M., Aspects of the Thermal Regime on the Periglacial Belt of Southern Carpathians (Romania), TICOP, *Tenth. Intern Conf. on Permafrost*, Salekhard, 25-29 iunie, **2012**.

Voiculescu, M., Onaca, A., Chiroiu, P., Spatio-temporal reconstruction of snow avalanche activity using dendrogeomorphological method in Bucegi Mountains, Romanian Carpathians, *International Snow Science Workshop,* Anchorage (Alasaka), 16-21 septembrie **2012**.

2013

Bojariu R. and R. Cica: predictive potential of the cryosphere-atmosphere interaction at seasonal and annual scales. National Criosfera Symposia (21-25 Februay 2013), Piatra Neamt, Romania.

Bojariu R., R. D. Cică and L. Velea: Atmosphere/cryosphere interaction over Eurasia and its relevance to climate predictability. Atmosphere and Cryosphere Assembly DACA-13 Air, Ice & Process Interactions, Davos, 2013.

Micu D and I. C. Sandric: Snow line analysis in the Romanian Carpathians under the influence of winter warming. EGU General Assembly, Vienna, Austria, 2013.

Perju, E.-R., Balin, D., Lane, S.; Zaharia, L.: Changing flood magnitude and frequency in snow-melt dominated catchments: the case of the Bucegi Mountains, in the Romanian Carpathian region. EGU General Assembly, Vienna, Austria, 2013.

Urdea, P., Onaca, A., Ardelean, A., Șerban, R., Sîrbu, F., Permafrost existence in rock glaciers of the Southern Carpathians, *8th IAG International Conference on Geomorphology*, Paris, 27-31 august **2013**.

Urdea, P., Onaca, A., Ardelean, F., Pușan, R., Geophysical investigations in the periglacial belt of the central area of Făgăraș Mountains, *Carpatho-Balkan-Dinaric Conference on Geomorphology*, Stara Lesna, Tatranska Lomnica, 24-28 iunie, **2013**.

Voiculescu, M., Onaca, A., Chiroiu, P., Recent dendrogeomorphic approaches in Romanian Carpathians. Spatio-temporal reconstruction and patterns of snow avalanche activity in Făgăraș massif and Bucegi Mountains (Southern Carpathians) – Romanian Carpathians, *8th IAG International Conference on Geomorphology,* Paris, 27-31 august **2013**.

2014

Ardelean, A., Onaca A., Urdea, P., Quantifying sediment storage within a small alpine catchment of the Făgăraș Mountains (Doamnei Valley, 3,5 km^2), *Eigth IAG SEDIBUD (Sediments Budgets in Cold Environments),* Zugspitze, 1-4 Septembrie, 2014.

Onaca, A., Ardelean A., Urdea, P., Ardelean, F., Investigations regarding the internal structure of rock glaciers and alpine talus slopes from Southern Carpathians assessed by Ground-Penetrating Radar (GPR), 4th European Conference on Permafrost, Evora, 18 – 21 iunie **2014**

Perşoiu A., I. Popa: Solar and volcanic forcing of summer air temperatures - a combined ice core and tree ring perspective form the Carpathian Mts. (Europe). EGU General Assembly, Vienna, Austria, 2014.

Veni, G., Land, L., Perşoiu, A., Time, money and melting ice: Proposal for a cooperative study of the world's cave ice in a race against climate change, George VeniVI[th] International Workshop on Ice Caves, Idaho falls, USA, August 17-22, 2014.

Urdea, P., Sîrbu, F., Onaca A., Magori, B., The influence of Microtopography on the Ground Surface Temperature of Judele Rock Glacier, Retezat Mountains, Southern Carpathians (Romania), 4th European Conference on Permafrost, Evora, 18 – 21 iunie **2014**.

References

2011

Covăsnianu, Adrian, Mapping Snow Avalanche Risk Using GIS Technique and 3D Modeling: Case Study Ceahlau National Park (July 12, 2011). Available at SSRN: http://ssrn.com/abstract=1884082 or http://dx.doi.org/10.2139/ssrn.1884082

Munteanu A., A. Nedelea, and L. Comanescu, 2011: The dynamics of the snow avalanche affected areas in Piatra Mica mountains (Romania), *Comptes Rendus Geoscience*, **343** (10), pp 691–700

Perşoiu, A., 2011: Palaeoclimatic Significance of Perennial Ice Accumulations in Caves: an Example from Scarisoara Ice Cave, Romania, − PhD. Thesis, University of South Florida, USA, http://scholarcommons.usf.edu/etd/3291.

Perşoiu, A., Onac, B.P. & I. Perşoiu, 2011: The Interplay Between Air Temperature And Ice Mass Balance Changes In Scarisoara Ice Cave, Romania, *Acta Carstologica*, **40**, 445–456.

Perşoiu, A., B. P. Onac, J. G. Wynn, A.-V. Bojar, and K. Holmgren, 2011: Stable isotope behavior during cave ice formation by water freezing in Scărişoara Ice Cave, Romania, *J. Geophys. Res.*, **116**, D02111, DOI:10.1029/2010JD014477.

Perşoiu, A. and Pazdur, A., 2011: Ice genesis and its long-term mass balance and dynamics in Scărişoara Ice Cave, Romania, *The Cryosphere*, **5**, pp 45-53, doi:10.5194/tc-5-45-2011

Feurdean, A., Perşoiu, A., Pazdur, A. & B.P. Onac, 2011: Evaluating the Palaeoecological Potential of Pollen Recovered from Ice in Caves: A Case Study from Scarisoara Ice Cave, Romania, *Review of Palaeobotany and Palynology*, **165**, pp 1–10.

2012

Petre A. C., Nedelea A., Comănescu L. and Munteanu, A., 2012: Terrain Susceptibility to Geomorphological Processes and their Impact on Tourism Infrastructure in the Sâmbata Valley (Făgăraş Mountains, Romania), *Procedia Environmental Sciences*, **14**, pp 257-266, DOI: 10.1016/j.proenv.2012.03.025

Rimbu N, Onac B. P., Racovita G., 2012: Large-scale anomaly patterns associated to temperature variability inside Scărișoara Ice Cave, *Int. J. Climatol.*, **32**, pp 1495–1502. DOI:10.1002/joc.2369

Vespremeanu-Stroe, A., Urdea, P., Popescu, R. and Vasile, M., 2012: Rock Glacier Activity in the Retezat Mountains, Southern Carpathians, Romania. *Permafrost Periglac. Process*., **23**, pp 127–137. DOI: 10.1002/ppp.1736

Voiculescu, M., Ardelean, F., 2012: Snow avalanche - disturbance of high mountain environment. Case study - the Doamnei glacial valley the Făagăraş Massif Southern Carpathians, Romanian Carpathians. Carpathian J. Earth Environ. Sci., **7**(1), pp 95-108.

2013

Munteanu A., A. Nedelea, L. Comanescu, V. Stoica, 2013: The Impact of Snow Avalanches on the Tourist Activities in the Upper Area of the Piatra Craiului Massif, *Journal of Environmental and Tourism Analyses*,. **I.1**, pp 21 -29

Onaca A. L., P. Urdea, A. C. Ardelean, 2013a: Internal Structure and Permafrost Characteristics of the Rock Glaciers of Southern Carpathians (Romania) Assessed by Geoelectrical Soundings and Thermal Monitoring, *Geografiska Annaler: Series A, Physical Geography,* **95** *(*3), pp 249-266, DOI: 10.1111/geoa.12014

Onaca A., P. Urdea, A. Ardelean and R. Şerban, 2013b: Assessement of internal structure of periglacial landforms from southern carpathians (Romania) using dc resistivity tomography, *Carpathian Journal of Earth and Environmental Sciences*, **8** (2), pp 113 - 122

Voiculescu, M. and A. Onaca, 2013: Snow avalanche assessment in the Sinaia ski area (Bucegi Mountains, Southern Carpathians) using the dendrogeomorphology method., *Area*, pp 109-122 **45**(1) DOI: 10.1111/area.12003

Kern Z., and A. Perşoiu, 2013: Cave ice – the imminent loss of untapped mid-latitude cryospheric palaeoenvironmental archives, *Quaternary Science Reviews*, **67**, pp 1–7

Žák K., M. Orvošová, M. Filippi, L. Vlček, B. P. Onac, A. Perşoiu, J. Rohovec, I. Světlík, 2013: Cryogenic Cave Pearls In the Periglacial Zones of Ice Caves, *Journal of Sedimentary Research*, **83** (2), pp 207-220

2014-2015

Bîrsan M. V., and A. Dumitrescu, 2014: Snow variability in Romania in connection to large-scale atmospheric circulation. *Int. J. Climatol*., **34**, pp 134-144. DOI: 10.1002/joc.3671

Bojariu R, Birsan MV, Cică R, Velea L, Burcea S, Dumitrescu A, Dascălu SI, Gothard M, Dobrinescu A, Cărbunaru F, Marin L, 2015: Schimbările climatice – de la bazele fizice la riscuri și adaptare (Climate change – from physical basis to risk and adaptation). Printech, București. 200 p. ISBN 978-606-23-0363-1

Chiroiu P., M. Stoffel, A. Onaca, P. Urdea, 2015: Testing dendrogeomorphic approaches and thresholds to reconstruct snow avalanche activity in the Făgăraş Mountains (Romanian Carpathians), *Quaternary Geochronology*, **27**, pp 1-10, DOI:10.1016/j.quageo.2014.11.001

Hillebrand-Voiculescu A., C. Itcus, I. Ardelean, D. Pascu, A. Perșoiu, A. Rusu, T. Brad, E. Popa, B. P. Onac, C. Purcarea, 2015: Searching for cold-adapted microorganisms in the underground glacier of Scarisoara Ice Cave, Romania, *Acta Carsologica*, **43**/2–3, pp 319–329, DOI: 10.3986/ac.v43i2-3.604

Malnes E., A. Buanes, T. Nagler, G. Bippus, D. Gustafsson, C. Schiller, S. Metsämäki, J. Pulliainen, K. Luojus, H. E. Larsen, R. Solberg, A. Diamandi and A. Wiesmann, 2015: User requirements for the snow and land ice services – CryoLand, *The Cryosphere Discuss.*, **9,** pp 791–816, 2015 www.the-cryosphere-discuss.net/9/791/2015/ DOI:10.5194/tcd-9-791-2015

Popescu, R., Vespremeanu-Stroe, A., Onaca A., Cruceru, N., *(2015)*, Permafrost research in the granitic massifs of Southern Carpathians (Parâng Mountains), *Zeitschrift für Geomorphologie, 59 (1), 1-20.DOI: 10.1127/0372-8854/2014/0145*

Voiculescu, M., Onaca, A., 2014: Spatio-temporal reconstruction of snow avalanche activity using dendrogeomorphological approach in Bucegi Mountains Romanian Carpathians. *Cold Regions Sci*. Technol, **104-105**, pp 6375, DOI:10.1016/j.coldregions.2014.04.005

International Association of Geodesy

IAG

I A G ACTIVITIES IN ROMANIA

2011 - 2014

Romanian IAG Committee

President

Prof. Dr. Johan NEUNER
Technical University of Civil Engineering
Bucharest

Phone: +40-21-243 36 21
Fax: +40-21-242 07 93
E-mail: hneuner@gmail.ro

Members

Prof. Dr. Constantin MOLDOVEANU
Technical University of Civil Engineering
Bucharest

Phone: +40-21-243 36 21
Fax: +40-21-242 07 93
E-mail: c.moldoveanu@gmail.ro

Dr. Lucian BESUTIU
Institute of Geodynamics "Saba Stefanescu"
Romanian Academy

Phone: +40-21-317.21.27
Fax: +40-21-317.21.20
E-mail: besutiu@geodin.ro

Secretary

Dr. Tiberiu RUS
Technical University of Civil Engineering
Bucharest

Phone: +40-21-243 36 21
Fax: +40-21-242 07 93
E-mail: rus@utcb.ro

National Report on Geodetic and Geophysical Activities in Romania - ISBN

Contributions in Geodesy

Section I: Positioning and Reference Frames

1. Background

For the time interval 2011-2014 geodetic activities in Romania were in progress according to the economy and social situation. Economical development in our country after integration into European Union concluded to some positive effects mainly for the time interval 2007-2009. The professional bodies reorganized and for geodetic activities the Geodesists Order was created by Law 17/2006 for organizing the geodesists profession according to the Law 7/1996 – Cadastre and Real Estate law. A drawback on this activity was done by suspending the Geodesists Order Law. At present the situation still remains the same even efforts to unlock were done especially by professional body – Romanian Geodesists Union (UGR).
The National Agency for Cadastre and Land Registration (NACLR) under Ministry of Regional Development and Administration is the state responsible institution for geodetic and mapping activities in Romania. From a budget financing public institution NACLR was transformed since 2014 in a self financing institution. NACLR includes the national mapping activities and 42 Cadastre and Land Registration Offices. As research and production institution acts the National Centre for Cartography (former National Centre for Geodesy, Cartography, Photogrammetry and Remote Sensing). Due to the difficult economical situation, in 2009 and 2010, NACLR was reorganized by decreasing the employees number, but after September 2014, it comes back to previous financial form.

2. Global Navigation Satellite System (GNSS) Network

According to the global and European trends in the field of modern geodetic networks, Romania followed this trend by promotion and implementation of a new high accurate geodetic network in the time interval 2007-2012. The new geodetic network it is build as an active continuously operating network. As technological equipments the GNSS (GPS and GPS+GLONASS) receivers are included into the network. Plans for Galileo GNSS technology implementation are future infrastructure elements.
Starting 1999, when it was installed the first GPS permanent station in Romania at the Faculty of Geodesy - Technical University of Civil Engineering Bucharest (BUCU) in cooperation with Federal Agency for Cartography and Geodesy Frankfurt a.M. (Germany), the new methods of global satellite positioning were introduced in Romania.

In 2001 the National Office for Cadastre, Geodesy and Cartography (reorganized in 2004 as National Agency for Cadastre and Land Registration) installed 5 GPS permanent stations in Braila, Suceava, Cluj, Sibiu, Timisoara (BRAI, SUCE, CLUJ, SIBI, TIMI) as a necessity for the precise geodetic measurements in the area. Romania as a CERGOP (Central European Regional Geodynamic Project) country member installed two GPS permanent stations in Craiova and Constanta in 2004 (CRAI, COST). In 2005 the continuously modernization of the National GNSS Permanent Network consisted in the installation of 5 new GPS permanent stations in Bacau, Deva, Baia Mare, Oradea and Sfântu Gheorghe (BACA, DEVA, BAIA, ORAD, SFGH). With their own funds or from PHARE and World Bank the GNSS network was continuously extended by the National Agency for Cadastre and Land Registration (NACLR) in 2007-2010.

At the end of 2010 the Romanian GNSS permanent network included 60 GPS and GNSS permanent stations installed by NACLR and one GNSS permanent station installed at the Faculty of Geodesy, Technical University of Civil Engineering Bucharest Bucharest. The EUREF(EPN) station BUCU was introduced into the IGS network since 2005 and was modernized in 2008 with the help of the Federal Agency for Cartography and Geodesy Frankfurt a.M. (Germany). Other 6 stations were modernized in 2009 by replacing old equipments (Leica System 530) with new equipments (Leica 1200 GNSS+, AR25 antennas). In 2012, the last 15 GNSS permanent stations were installed increasing the GNSS permanent network up to 74 stations.
Romania it is member of the EUPOS (European Position Determination System) organization contributing to the standards adopted by members from Central and East European countries and EUPOS infrastructure by realizing *ROMPOS (Romanian Position Determination System)* based on the 60 GPS and GNSS permanent stations.

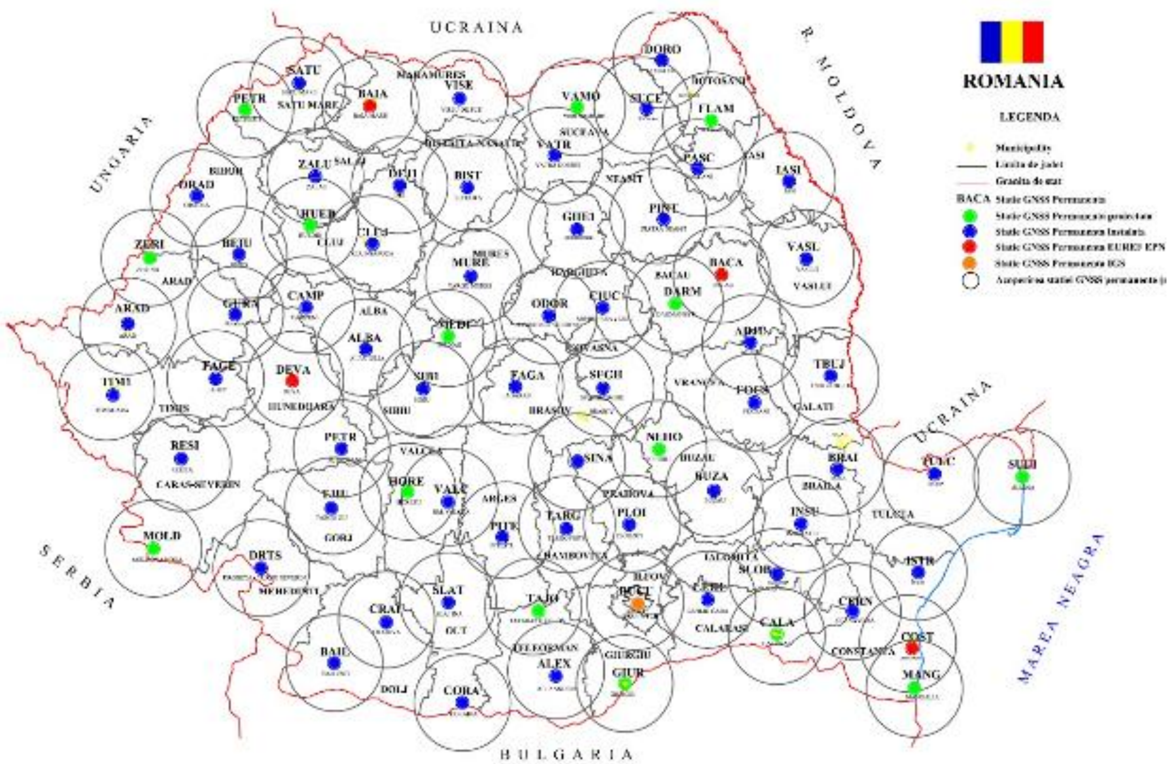


Figure 1a. Romanian National GNSS Permanent Network (ROMPOS) – 2012
(red – IGS/EUREF/EUPOS sites; blue – previous 2012 sites; green – 2012 sites)

In January 2006, the NACLR integrated in the EUREF-EPN (European Permanent Network) 4 new GPS permanent stations: BACA, BAIA, COST and DEVA as a contribution to the European reference frame maintenance and other special projects. The EUREF-EPN GPS station in Constanta (COST) it is located near to a tide gauge and it is connected with this by precise leveling. The accuracy for the coordinates of the stations are better than +/- 1cm. All stations are Class A according to EUREF-EPN standards.

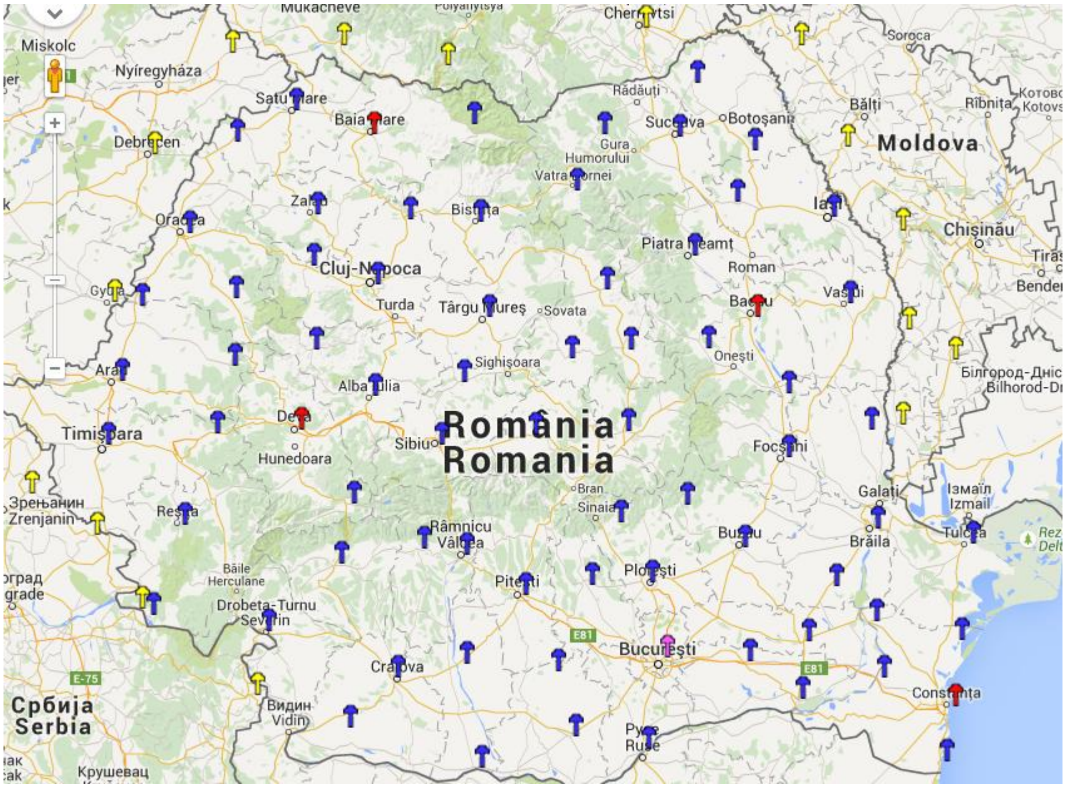


Figure 1b. ROMPOS – 2015 – including neighbour countries stations
(red – IGS/EUREF/EUPOS sites ; yellow included stations from HU, MD,SR and UA)

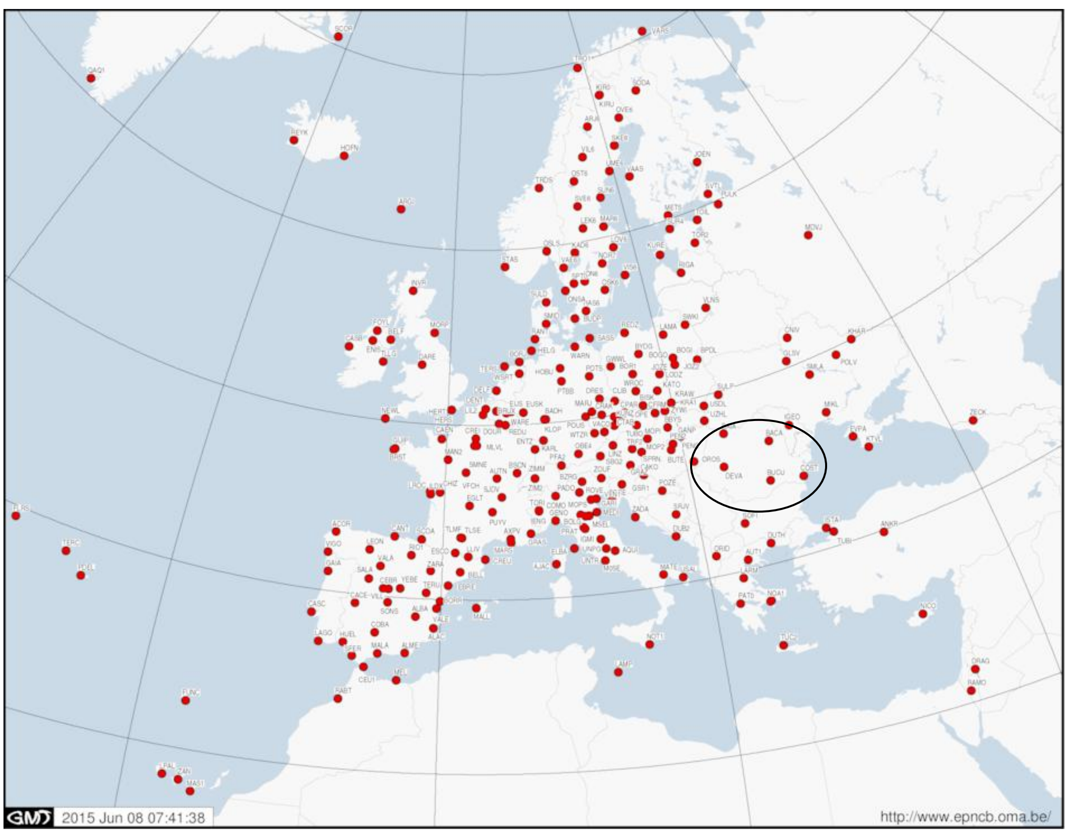


Figure 2. IGS and EUREF-EPN stations in Romania (Bucu, Baia, Baca, Cost, Deva)

The National Space Geodetic Network (GNSS) was proposed to be divided into "classes" to be separated from the old triangulation network divided in "orders". The proposed classes and present status are presented in the next table.

The National Spatial Geodetic Network (NSGN) is formed from the total ground points that have coordinates determined in the ETRS89 Coordinate Reference System and normal heights in Black Sea 1975 reference system, with the possibility to be transformed into the Vertical European System (EVRS).

National Spatial Geodetic Network is structured on classes, using the precision and density criteria, as in the following table.

Table 1. Classification of the NSGN components

Network class	ID	MSE (cm)	No. points/Density/ Distribution	Domain / Observations
National Spatial Geodetic Network Class A0	A0	1.0	*5 GNSS permanent stations (IGS and EUREF-EPN) 1 point / 50000 km^2 Uniform distribution*	- link to the global and European geodetic networks; - regional and local geodynamics measurements, deformation determination real time positioning services, meteorology
National Spatial Geodetic Network Class A	A	1.0	*74 GNSS permanent stations 1 point / 3250* km^2 *Uniform distribution*	- link to the class A0 network, - regional and local geodynamics measurements, deformation determination real time positioning services, meteorology
National Spatial Geodetic Network Class B	B	2.0	*330 points 1point ./700km^2 Uniform Distribution*	- regional and local geodynamics measurements, high precision topographic determinations
National Spatial Geodetic Network Class C	C	3.0	*About 4750 points 1point/50km^2 Uniform distribution*	- high precision topographic measurements, cadastre; -partial realized
National Spatial Geodetic Network Class D	D	5.0	*At least 1point/5km^2 even distribution*	- topographic measurements, densification networks, G.I.S. - partial realized

MSE – Mean Square Error of the 3D position determination

Class B network was observed in 2003 and the results were included into national database in 2005. From the total number of stations about one third have geometric leveling. A number of 86 stations are old triangulation markers observed by GPS with coordinates in national geodetic reference system Krasovski ellipsoid and Stereographic 1970 projection system). The Class B network was constrained on the Class A network. The precisions for the coordinates of these stations are less than 2cm. Class C network including more than 1000 stations was observed since 2005 till present and it is not yet complete. The precisions for the coordinates of these stations are less than 3cm. Class D network will be realized in general for cadaster with no uniform distribution and the precision of these stations will be less than 5 cm. [http://gnss.rompos.ro]

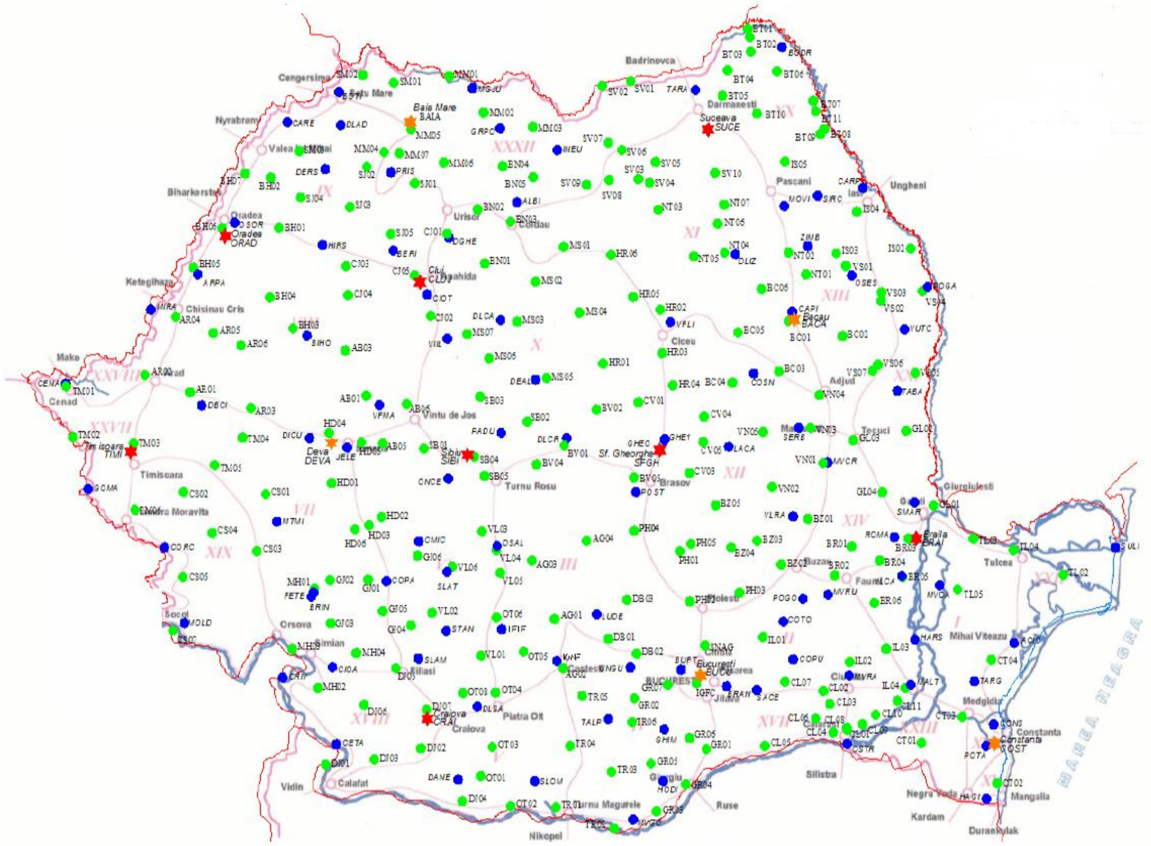


Figure 3. Class B - National Spatial Geodetic Network (NSGN)
(green – new monuments; blue – old monuments from triangulation network)

3. Leveling Network - Romanian Contribution to EVRS Realization

The National Leveling Network it is divided in 5 orders (function of precision). The National Precise Leveling Network of Ist order consists in a number of 19 polygons with a length of 6600 km and includes 6400 points with a density of 1 point/km^2. 24 leveling lines establish the connections with neighbour countries: 2 with Ukraine, 1 with Republic of Moldova, 6 with Bulgaria, 10 with Serbia/Montenegro and 5 with Hungary.

This network was densified till 32 polygons with levelling networks of IInd -Vth order (see Figure 4). Normal heights are available for the National Leveling Network.

The Romanian contribution to UELN (2000) contains the nodal points of the polygons of first order (65 points) and 89 levelling observations.

In 2007 the National Agency for Cadaster and Land Registration introduced officially the results of a new adjustment of the leveling network performed by National Center for Geodesy, Cartography, Photogrammetry and Remote Sensing and Technical University of Civil Engineering Bucharest as "Black Sea 1975 datum (Edition 1990)".

The EUVN97 (European Unified Vertical Network 1997) included 4 points from the Romanian Levelling Network: RO01 (Sirca-Iasi), RO02 (Constanta), RO03 (Timisoara) and RO04 (Tariverde – Height 0) points measured with GPS technology and absolute gravity. For these points the known ETRS89 coordinates and normal heights (precise levelling) in Black Sea 1975 datum were determined together with absolute gravity.

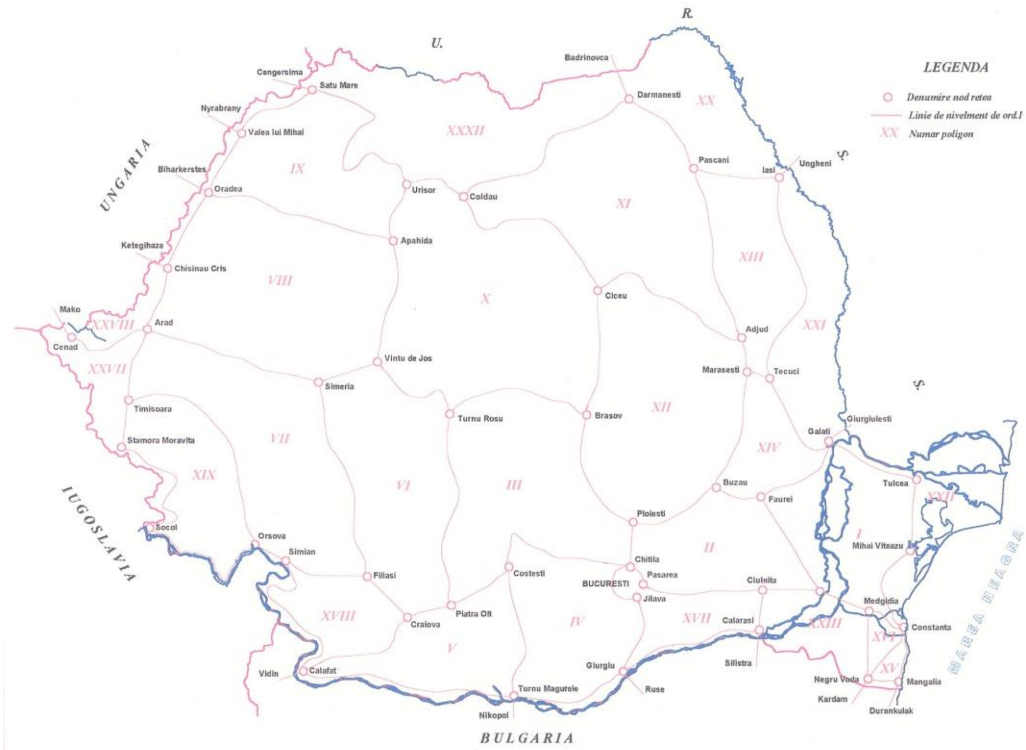


Figure 4. Romanian Leveling Network

For the ECGN project in September 2004, Austrian Federal Office of Metrology and Surveying (BEV– Bundesamt fuer Eich-und Vermessungswessen) in cooperation with Romanian National Agency for Cadastre and Land Registration (NACLR) and Military Topographic Directorate, performed an absolute gravity observation campaign in Romania. A number of 4 absolute gravity stations were observed by JILAg-6 absolute gravimeter. Romania participated with such information to the EVRS realization - EVRF2000 and EVRF2007.

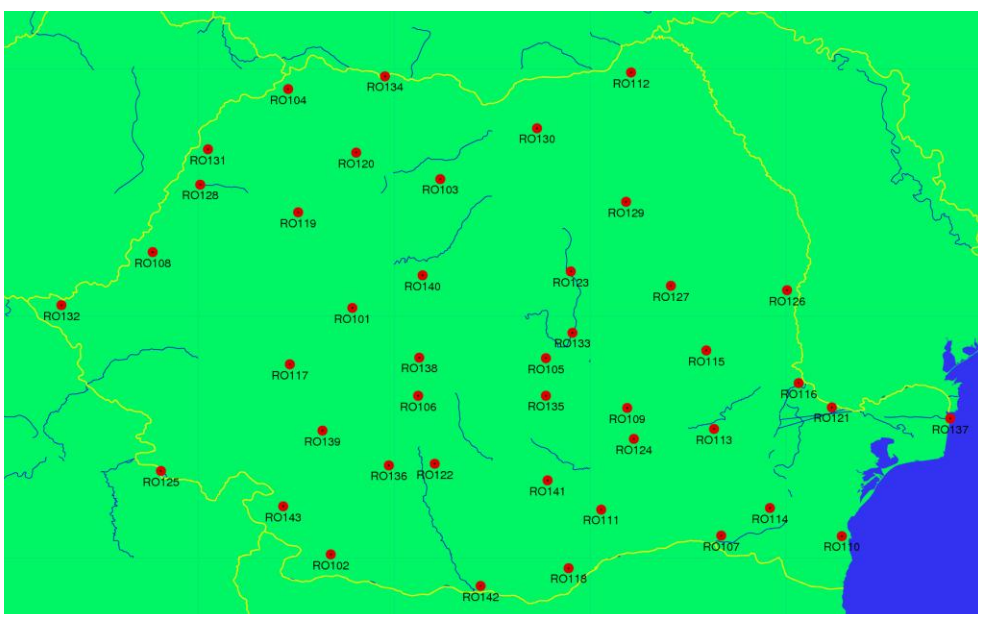


Figure 5. Romanian contribution to EUVN_DA project (2009)

After 2000 year Romania further contributed by providing new data including 43 stations with ETRS89 ellipsoidal heights and normal heights in national height reference system (Fig.5). This was the contribution to the EUVN_DA (Densification Action) project with final result the EVRF2007 realization. 25 European countries participated and submitted the data of more than 1500 high quality GPS/leveling benchmarks. The submitted data was validated and converted into uniform reference frames. The final report was discussed at Technical Working Group meeting and presented at the EUREF2009 symposium, held in Florence (Italy). The results were circulated to all contributing National Mapping Agencies including Romanian National Agency for Cadastre and Land Registration.

This action it is continued in Romania by NACLR. For each county it is planned to be realized a number of minimum 5 such stations.

As a final EVRF2007 realization in Romania, a standard transformation parameters were computed by EVRF computing centre from Federal Agency for Cartography and Geodesy (BKG, Germany). These set of parameters realize the transformation of normal heights from Black Sea 1975 System to EVRF2007 (RO_CONST / NH to EVRF2000 and EVRF2007).

Transformation parameters were derived from 48 identical points (UELN nodal points) with a transformation RMS of 0.004 m, and residual deviation between -0.012 m and +0.013 m.

A general view of the EVRF2007 realization in comparison with national height reference systems can be seen on the next picture.

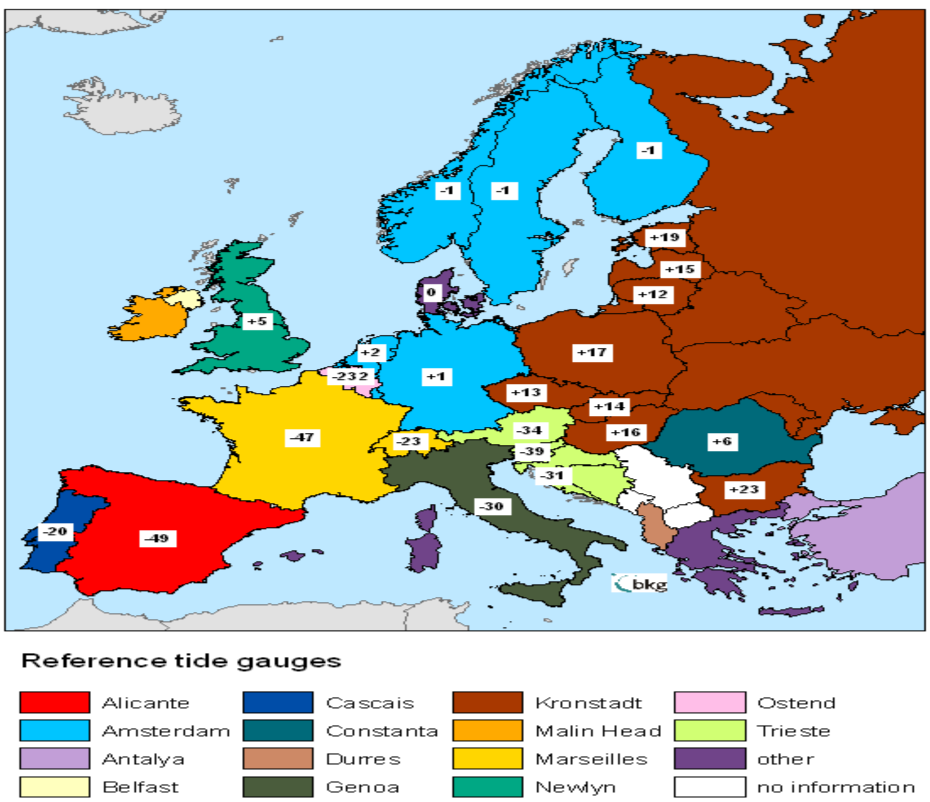


Figure 6. Mean differences between EVRF2007 and national height reference systems (+6 cm Romania)

In 2009, NACLR finalized the coordinate transformation including a distorsion model from ETRS89 system to S42 (Krasovski ellipsoid) – Stereographic 1970 projection system and provided *TransDatRo* software and algorithm for the users.

Transformation of normal heights from Black Sea 1975 System to EVRF2007, finalized at the present moment, complete the most recent link between the national coordinate reference systems and pan-European systems. NACLR intends to include this option in the software package for coordinate transformation *TransDatRO* which is published on internet and was implemented on national geoportal for spatial data harmonization and interoperability. The transformation parameters were published on the on-line information system *(http://www.crs-geo.eu/)*, which contains the descriptions of the different national Coordinate Reference Systems (CRS) for position in Europe as well as the transformation parameters from the national systems to the ETRS89 according to the ISO standard 19111 Geographic information - Spatial referencing by coordinates.

- About 80% of the GNSS permanent stations included in the national GNSS reference network, are connected by leveling with the national leveling network (precise leveling close to the building and than precise trigonometric leveling to the antenna).
- A new leveling campaign was started by NACLR in 2010 and was continued in 2011 and 2012 in the metropolitan area of Bucharest. The goal of the project was to establish and densify the national leveling datum for this area by precise (geometric) leveling. The project included gravity observations in this area in order to compute a local quasigeoid (+/- 5 cm rms).

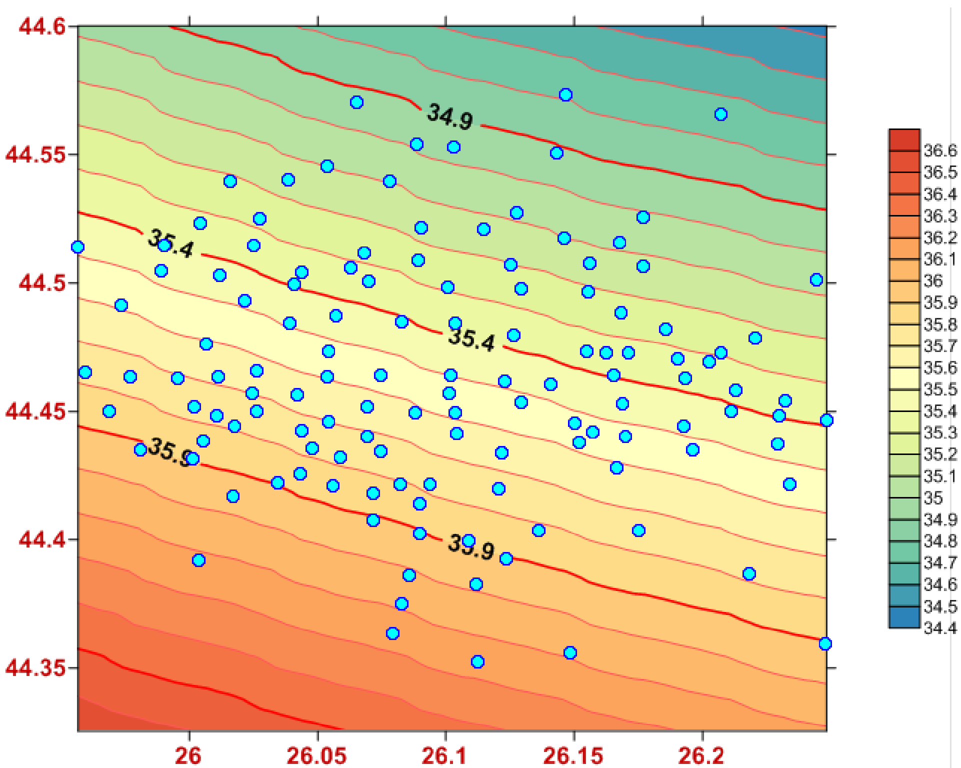


Figure 7. Local quasigeoid for Bucharest and Ilfov county (129 points observed)

4. PROJECTS

Romania participate especially by National Agency for Cadastre and Land Registration to the international and national projects. The most important projects are mentione0d below.

- **European Position Determination System (EUPOS) – interregional cooperation**
  The main objectives of the project are to strengthen the cooperation and cohesion between the participating countries and regions from Central and East Europe and to create awareness for the benefits of satellite-based applications. It can be reported that the goal will be achieved by the operation. The cooperation between the countries and regions was extended from only some higher level persons to the working level by the cooperation of the GNSS National Service Centres or Know-how offices, by the regional workshops and study visits. New standards for the EUPOS components were developed and implemented and a common data centre will be created. Cross border cooperation was improved and GNSS realtime data exchange extended step by step. Cooperation agreements were signed with relevant organizations in Europe (EUREF, EUMETNET).
  Romania by NACLR participated at five EUPOS conferences (19,20,21,22,24th) including the 22nd held in Bucharest.
- **EuroBoundaryMap (EBM) –** The objective of the project it is to realize a geospatial data set for Europe including the administrative limits of Romania, their codes and names for 1:100000 scale. In August 2014 version 9.0 was released, and the limits were updated for the beginning of 2014 year.
- **EuroGlobalMap (EGM) –** The objective of the project it is to realize a uniform set of geospatial data at 1:1000000 scale for the entire Earth. Version 5.1 of this product was released in 2014.
- **EuroRegionalMap (ERM) -** The objective of the project it is to realize a uniform set of geospatial data for Europe at 1:250000 scale structured in seven thematic layers: administrative boundaries, hydrographs, transport, localities, vegetation and soil, topographic names, and others (high power lines, tourist buildings, parks, national parks et al.). Update rate for this products it is one year. Version 8.0 for Romania was provided in October 2014.
- **Euro Digital Elevation Model (EDM)** - The main objective of the project is a digital representation of the ground surface topography of Europe, (not including 'first surface' elevations such as vegetation and man made structures). Geospatial elevation data is used by the scientific and resource management communities for applications relevant for environmental hydrologic cartography such as ortho-rectification of imagery, creation of relief maps, flight simulations, design of mobile telephone networks, geological structure studies. EuroDem data are essential for applications Fast Track Services, which are to be implemented within GMES (Global Monitoring for Environment and Security). The participants have also taken into consideration the financial aspects, aiming at creating a cheap product comparing with the prices of other products from the market. EuroDem is provided from the national data bases by the National Mapping and Cadastral Agencies. According to the Eurogeographics policy, the updating as well as the distribution of the product is regulated by agreements signed by all projects partners, including ANCPI.
- **New ortophoto products in Romania –** In the time interval 2011-2014, new ortophoto products were realized as: large scale ortophoto for Bucharest (1: 500 scale) and at 1:1000 scale for other main cities in Romania (Ploiesti, Târgoviste, Constanta, Brasov et

al.); Starting with 2010 year, Military Topographic Directorate provided ortophoto products for Ministry of Agriculture and other state institutions.

- **Cadastre and land registration** activities were continuously performed on private initiatives but also on state projects. Some projects were developed as the *CESAR (“Complementing EU Support for Agriculture Restructuring”)*. Romania has received financing in the amount of EUR 47,700,000 equivalent from the World Bank toward the cost of the Complementing European Support for Agricultural Restructuring, and it intends to apply part of the proceeds toward payments under the contract for systematic registration of immovable properties. The National Agency for Cadastre and Land Registration (NACLR) invited eligible bidders for executing systematic registration of immovable properties in 19 administrative territorial units (UAT) within 13 counties.
  CESAR project supported the *extension of national GNSS reference network with 15 new permanent stations* installed in 2012. For areas without or with bad GSM/GPRS coverage in Romania on the same project was achieved two mobile radio transmitters with a good coverage (30-50 Km radius) to be deployed in such areas to be able to broadcast RTK data (from ROMPOS system or locally generated corrections) for GNSS RTK users involved in projects as CESAR or other projects including RTK positioning.
- **Cross border cooperation programme – Danube WATER**
  Romania and Bulgaria started to develop in partnership a system of monitoring, warning and dissemination of data on the quality of environment in the border-area counties. The project will be achieved under the strategic project WATER - integrated water management and is financed under the Romania - Bulgaria Cross-border Cooperation Programme 2007-2013. The project was implemented by 12 partners from Romania and Bulgaria, for a period of 36 months from July 2012, having the goal to establish a common management and control system of the quality of the Danube waters under extreme conditions, caused by natural and technological disasters
  In order to implement the designed activities in the project area, one of the major infrastructure needed is the geodetic network and based on that a geo-database including digital maps, specific data and metadata, GIS applications, et al. Along the history, from geodetic point of view, for different activities on the Danube (navigation, water level and quality monitoring, floods management) different kinds of Coordinates and Reference Systems (CRS) were used by Danube countries. For the Romanian-Bulgarian sector, an important issue of this project was the establishment of a common CRS including horizontal (ETRS89) and vertical position (EVRS).
  Subactivity 6.1 of the project was dedicated to the *“Establishment (creation) of a common geodetic system for measuring the levels of the Danube River between Romania and Bulgaria – harmonization of the data”*. Subactivity 6.2 “*Surveying of landmarks and development of conversion standards”* had as major objectives to implement the common CRS adopted by both parties and to use this CRS for the other related activities of the project.

Figure 7. Water Project - water level stations along the Danube (yellow – RO stations,red – BG stations)

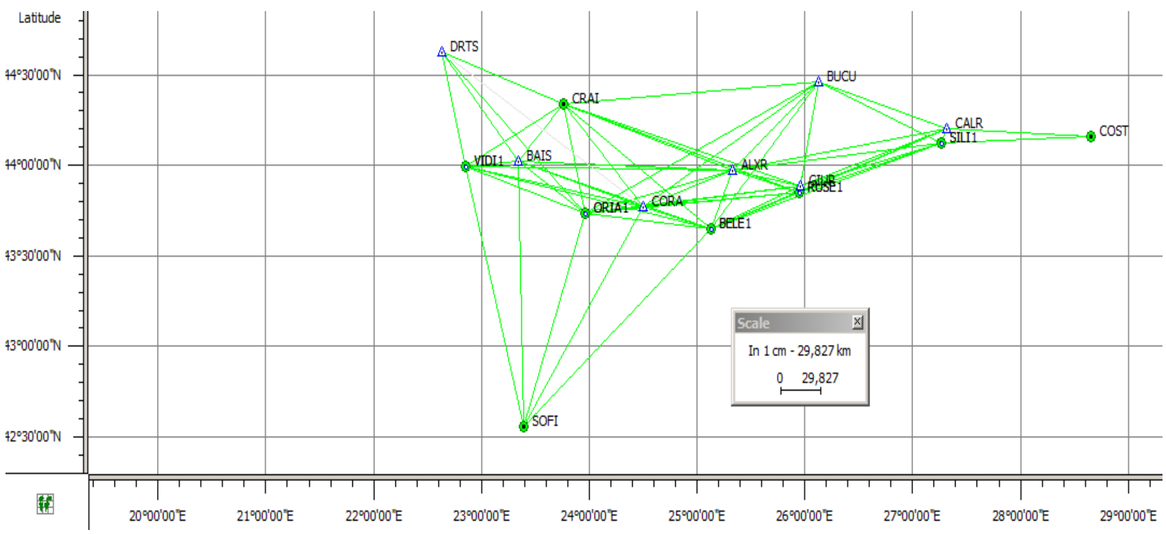


Figure 8. Main GNSS network for Danube Water project (9 stations RO / 6 stations BG)

Figure 9. Height determination for the depth gauges (geometric / trigon. levelling)

Geodetic network for the gauge stations along the common Romanian – Bulgarian Danube was realized under DANUBE WATER project. This network included GNSS and leveling observations. Landmark and water stages coordinates and heights are determined for Romanian and Bulgarian Danube banks in ETRS89 and EVRF2007 with precisions of 1cm (1D) - 3cm (3D). This network provides a connection for previous CRS in RO and BG. Other applications along this part of the Danube can benefit of results (navigation).

- **Realization of a support system for hydrographical works on the Danube to assure minimum navigation depths - BORD**

  Overall Objective of the project is to improve the safety of navigation of the Danube, in compliance with the European Directives and the Danube Commission's recommendations, taking into account the anticipated increase of cargo and passenger traffic during the next 10-15 years.

  The project was submitted by River Administration of the Lower Danube Galati for funding approval within the Operational Program "Transports" (POS-T) 2007-2013, Priority Axis 3, Key Area of Intervention 2- Improvement of Traffic Safety on all transport modes. The project was financed from EU-ERDF grants (85%).

  Specific Objective: setting in place a network of geodetic landmarks in support of the topo-hydrographical works on the Danube, for the monitoring of the minimum navigation depths and the improvement of fairway maintenance activities (floating and costal signaling, topo-hydrographic surveys, dredging). *Aim of the project*: to create a network of geodesic landmarks along the Romanian Danube sector, the Danube-Black Sea Canal and Poarta Alba - Midia - Navodari Canal, network to be used for the river bed dynamics monitoring and meant to provide exact data for the realisation of accurate Electronic Navigation Charts. A total of 432 landmarks in 144 locations situated at about 10 km spacing between were installed in 2014. Coordinates were computed from GNSS and leveling observations in ETRS89 and EVRS reference systems. The network was connected with national geodetic network (GNSS and leveling) and can be used for horizontal or vertical positioning in the area of Danube.

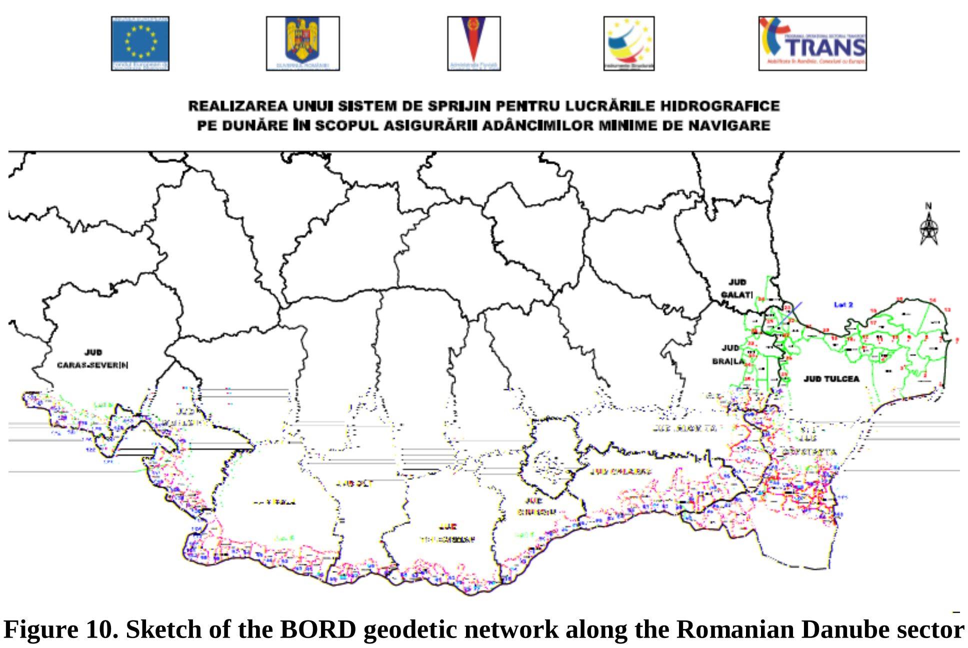


Figure 10. Sketch of the BORD geodetic network along the Romanian Danube sector

- **CERGOP (Central European Regional Geodynamic Project)**
The main objective of the project is to monitor the recent crust movements, detecting the borders of the tectonic plates and quantifying their three dimensional rates. The objective is achieved especially by the use of GPS/GNSS technology and other significant data sources. Romania participate at this project since 1995 by Technical University of Civil Engineering and National Centre for Geodesy, Cartography, Photogrammetry and Remote Sensing Bucharest (former Institute for Cadaster, Geodesy, Photogrammetry and Cartography) to the Work Package 10. „Geodynamics of Central Europe“, WP.10.2. *Three Dimensional Plate Kinematics in Romania*.

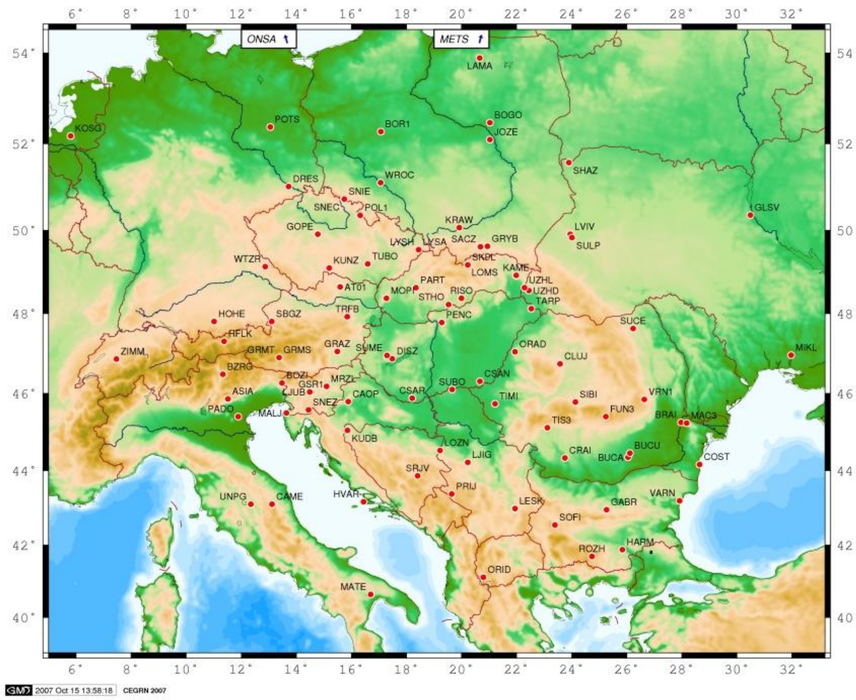


Figure 11. CEGRN network (http://cergop.oeaw.ac.at)

The main tasks of the project are:
- Romanian geodynamic research integration with Central European research;
- Establishment of reference geodetic network for geodynamic – CEGRN – Central European Geodynamic Regional Network, with less than 1cm accuracy;
- Tectonic plate velocity estimation on Romanian territory by geodetic methods (mainly GNSS);
- Realization of the monograph of Romanian geotectonic components;
- New technologies and methods for geodetic data processing;
- Close cooperation with similar institutions from participating countries;
- Dissemination of research results by different means (publications);
- New research projects proposals on geodynamic.

In the frame of the CERGOP a Central European Regional Geodynamic Network (CEGRN) was designed and realized including permanent and epoch stations observed by GPS technology. CEGRN was designed for geodynamic purposes (tectonic and geological position, markers, repeatability). The coverage includes the Central Europe (CEI countries) and was observed yearly (1994-1997) and every two years after (1999 – present). CEGRN was continuously extended with new stations, especially permanent stations in the last decade. Romania sends at present continuously GNSS data from 7 permanent stations to CEGRN data center in Graz (Austria) excluding the five Romanian EPN stations. Totally, data from 12 permanent stations are available continuously.

- **VRAGEO Project**
  VRAGEO is a service proposed in response to Partnerships Program - Applied Research Projects - Competition 2013, Priority area 3- Environment, Research direction 3.4.6. Natural and technological hazards; researches on risk assessment and impact studies. The main objective of VRAGEO is to enable free and open access to seismic hazard information in Romania due to Vrancea source in support of GMES (Global Monitoring of Environment and Security) through the development of an operational framework, a set of supporting tools and advanced geospatial surveillance methodologies of Vrancea tectonic active region. Project started in July 2014 and will end in Decembre 2016. For monitoring of the geophysical parameters having precursory character in Vrancea area, time-series geospatial data will be used in three distinct directions: 1) Pre-seismic crustal deformation with millimeters-centimeters precision order through GPS, radar satellite interferometry (TerraSARX, ALOS, future Sentinels); 2) Geomagnetic and ionospheric anomalies, short term or immediate seismic precursors over strong earthquakes areals expressed through Total Electron Content TEC provided by GPS permanent network stations or from real-time IPS - WDC for Solar-Terrestrial Science data; 3) Possible thermal surface anomalies inferred through surface latent heat flux (SLHF) and Land Surface Temperature (LST) changes from time-series satellite data in IR regions (NOAA-AVHRR, Terra/Aqua-MODIS, Landsat TM/ETM, ENVISAT, Sentinels).

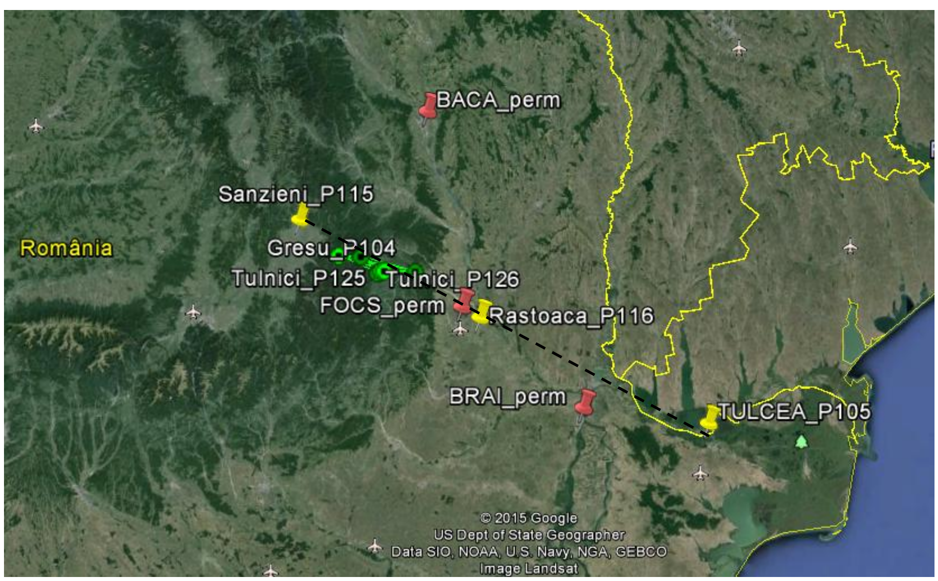


Figure 12. VRAGEO (geodynamic) network (red – perm. stations, yellow – epoch stations)

Section II: Advanced Space Geodesy

- **EUPOS (European Position Determination System)**

Romania participate by National Agency for Cadaster and Land Registration at the EUPOS (European Position Determination System). The EUPOS initiative is an international expert group of public organizations coming from the field of geodesy, geodetic survey and satellite deployment. Partners from CEE (Central and East European) countries have come together with the aim to establish in their countries compatible spatial reference infrastructures by using the Global Navigation Satellite Systems (GNSS) GPS, GLONASS and as soon as available GALILEO by building up Differential GNSS *EUPOS* reference station services. The *EUPOS* services *(RTK, DGNSS and Geodetic)* will allow a high accuracy and reliability for positioning and navigation and provide a wide range of geoinformation applications on this basis.

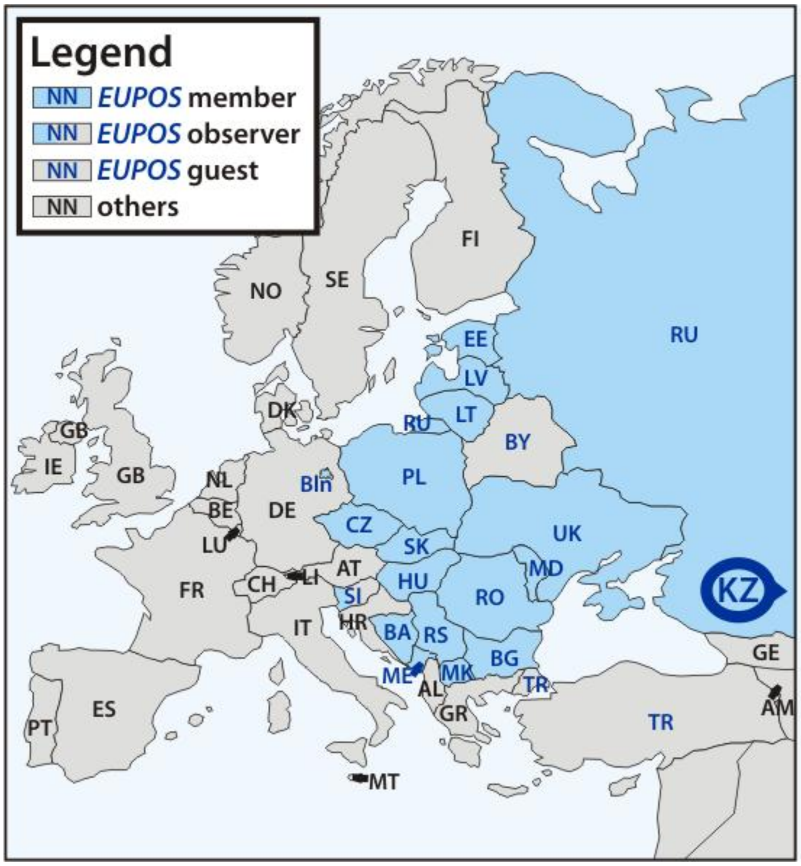


Figure 13. Distribution of EUPOS members - 2011 (www.eupos.org)

Members of the *EUPOS* cooperation (2011) are topically Bosnia and Herzegovina, Bulgaria, Czech Republic, Estonia, Hungary, Kazakhstan, Latvia, Lithuania, Macedonia, Moldova, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Ukraine and the German State Berlin. Slovenia has an observer status.

This fundamental infrastructure is based technically on a network of DGNSS reference stations and adequate communication lines. The data products can be used in many different applications requiring accuracy better than 3 m up to the 1 cm level in real-time *(DGNSS and RTK services)* and sub-centimeter precision by post-processing *(Geodetic service)*. This "full scale accuracy" concept aiming all types of users from environmental protection, transport and public security, hydrography, maritime surveying, river and maritime traffic, fishing, machinery and vehicle control, to spatial data infrastructure developers and to geodesy. *EUPOS* is independent of private company solutions and uses only international and unlimited worldwide usable standards. In case international agreed standards do not exist, *EUPOS* is working on the standardization in the corresponding organizations like the Radio Commission on Maritime Services, Special Committee 104 (RTCM SC 104). *EUPOS* provides the GNSS observation data and real-time corrections for high precise positioning and navigation with guaranteed availability and quality.

The responsibility of developing and operating the *EUPOS* reference station network is distributed among participating organizations on national level, which give the characteristic flavor of the organization. The backbones of the developments are the International *EUPOS* Steering Committee (ISC) and the National Service Center (NSC) concept, that requires the establishment of a NSC in every participating country.

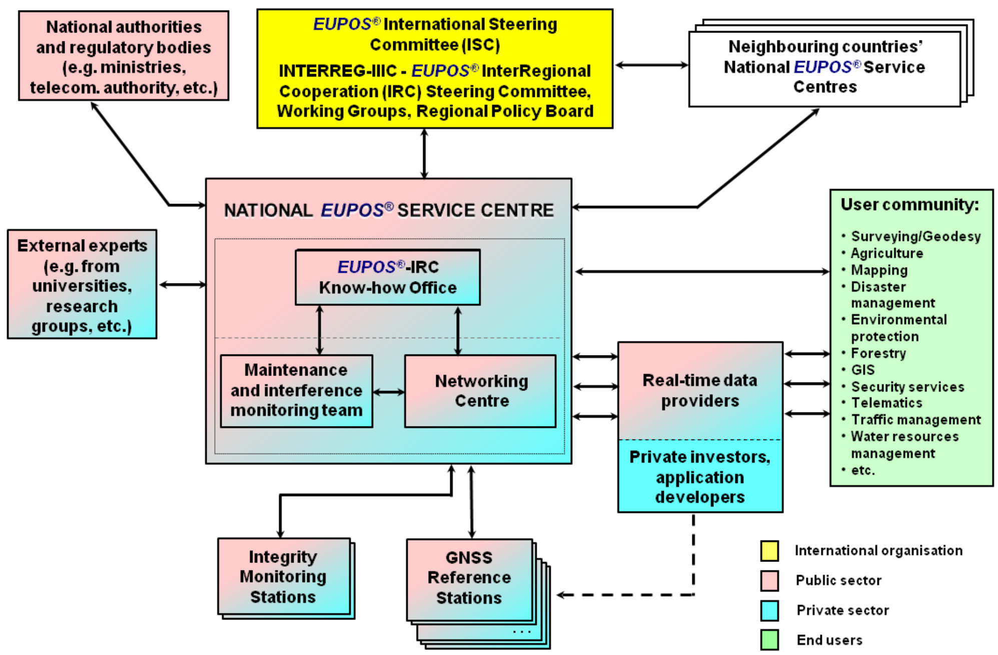


Figure 14. EUPOS National Service Centre structure

The NSCs are responsible not only for network developments and operation, but they are the focal points of user information, quality and integrity assurance and international relations with other *EUPOS* countries. The International *EUPOS* Steering Committee decides and agrees the organizational and technical framework of *EUPOS*. The ISC Office (ISCO) at the Senate Department for Urban Development in Berlin/Germany is the central point of contact for interests of international importance.

With the creation of the European Terrestrial Reference System (ETRS 89) in 1989, a three dimensional geodetic reference system became available for the whole Europe for the first time. Its spatial referencing connection is maintained up-to-date, notably through the EUREF Permanent Network (EPN), which contains the European stations of the International GPS Service (IGS). The ETRF base on the worldwide ITRF. *EUPOS* provides DGNSS correction data referred to ETRS.

NACLR has implemented in September 2008 the EUPOS services by Romanian Position Determination System (ROMPOS) according to the EUPOS standards based on the GNSS network with 48 permanent stations. Since 2010 the station number increased to 58 and was finalized in 2012 at 74 stations with station's spacing of about 70km.

ROMPOS services includes three services:

- *ROMPOS-DGNSS*
- *ROMPOS-RTK*
- *ROMPOS-GEO*

Table 2. Number of the *EUPOS* planned reference stations (2011)

No.	Country	Area [km2]	Number of planned *EUPOS* DGNSS reference stations
EU member countries			
1.	Berlin (ISCO)	891	4
2.	Bulgaria	110 950	23
3.	Czech Republic	78 870	26
4.	Estonia	45 220	13
5.	Hungary	93 030	36
6.	Latvia	64 600	24
7.	Lithuania	65 300	25
8.	Poland	312 680	100
9.	Romania	237 500	48
10.	Slovak Republic	49 035	21
11.	Slovenia	20 270	15
West Balkan States			
1.	Bosnia and Herzegovina	51 000	30
2.	Macedonia (FYROM)	25 330	15
3.	Serbia and Montenegro	88 360	32
Other countries			
1.	Russian Federation	17 075 000	500 ?
2.	Kazakhstan	2 713 300	500 ?
3	Ukraine	603 700	15
4.	Moldova	33 700	300
Total			1725 ?

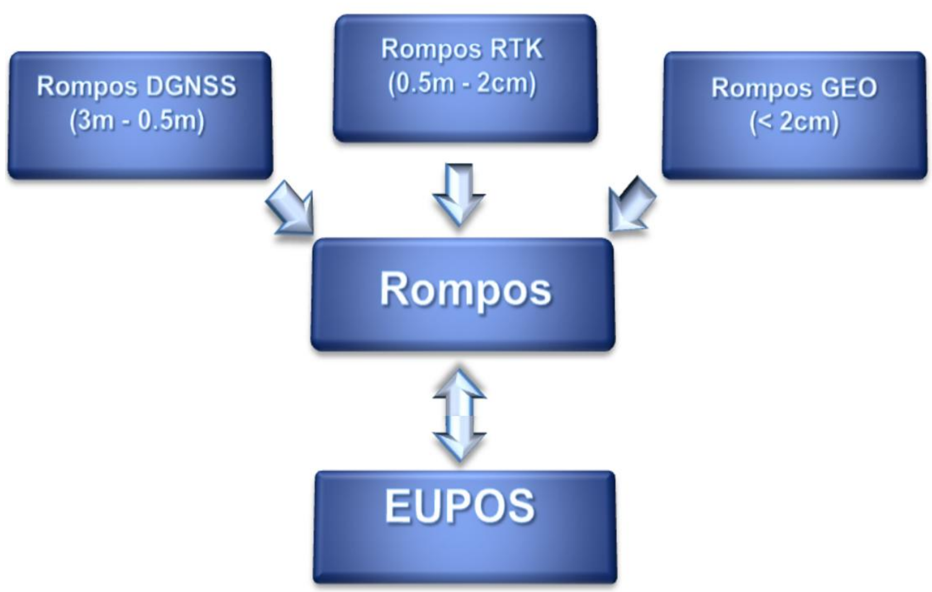


Figure 15. ROMPOS (Romanian Position Determination System) Services

- *ROMPOS DGNSS* for real-time DGNSS applications by code and code-phase measurements with metre up to sub-metre accuracy;
- *ROMPOS RTK* for real time DGNSS applications by carrier phase measurements with centimetre accuracy;
- *ROMPOS Geodetic* for post processing applications by code and phase measurements in static or kinematic mode with decimetre up to sub-centimetre accuracy.

In the EUPOS frame, Romania established a very closed cooperation with specialists from EUPOS countries including all neighbour countries (Bulgaria, Serbia, Hungary, Ukraine and Republic of Moldova). GNSS cross-border data exchange was technically already realized between GNSS stations from Romania and agreements are signed with Hungary, Moldova, Ukraine, Serbia and Bulgaria (2015).

New applications of the ROMPOS reference stations will be developed in the near future. Research activities are performed at Technical University of Civil Engineering Bucharest (Faculty of Geodesy) for GNSS meteorology and ionosphere/troposphere influences, reference frame establishment (ITRF, ETRF), geodynamics, engineering surveying based on GNSS (large structures monitoring) et al.

- **EGNOS**

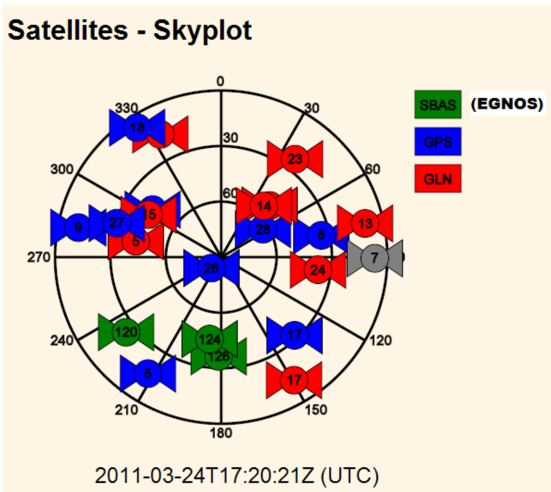
Known as a satellite-based augmentation system (SBAS), EGNOS provides both correction and integrity information about the GPS system, delivering opportunities for Europeans to use the more accurate positioning data for improving existing services or developing a wide range of new services. In the future EGNOS will be able to augment GALILEO in Europe.

The EGNOS signal is broadcast by three Inmarsat-3 satellites – one positioned east of the Atlantic, and the other above Africa – and by ESA’s Artemis satellite, which is also above Africa. These three satellites’ orbits are in the equatorial plane, at three different longitudes, with each able to broadcast EGNOS services across Europe. Unlike GPS, EGNOS offers integrity of signal, increased accuracy, coverage and a service level agreement (e.g. alert within specified time). This makes it suitable to provide a number of navigation services. For the most common applications, EGNOS gives a positioning accuracy of one to three metres, compared to the less accurate 10 to 15 m provided by GPS alone. The three services available are:

- Open Service
- Safety-of-Life Service
- EGNOS Data Access Server (EDAS)

The EGNOS *Open Service* has been available since *1 October 2009*. EGNOS positioning data are freely available in Europe through satellite signals to anyone equipped with an EGNOS-enabled GPS receiver. EGNOS Certification is now being managed by the European Commission, who have announced that since *1 March 2011,* EGNOS *Safety-of-Life* signal was formally declared available to aviation. For the first time, space-based navigation signals have become officially usable for the critical task of vertically guiding aircraft during landing approaches. EGNOS provides also a terrestrial commercial data service called the EGNOS Data Access Service (EDAS). EDAS is the single point of access for the data collected and generated by the EGNOS infrastructure. It supports the multimodal use of EGNOS (and later on Galileo) by disseminating EGNOS’ services in real time. In order to understand the market’s interest for EDAS data, a beta test was designed and works to allow industry, research institutes, and private and public organizations to free access to EDAS’ data. This test provides information to the provider of the EDAS service about potential users and how they use the data.

In Romania EGNOS system it is at present less used and needs a better promotion in order to inform the potential beneficiaries of services. According to geographic position of Romania, at the eastern border of EGNOS services, a better coverage would be necessary in the future if uniform services should be provided for all EU countries. The figure below presents the EGNOS signal acquisition at Faculty of Geodesy in Bucharest (GNSS permanent stations BUCU).



Satellites - Tracking Information

SV	Type	Elev. [Deg]	Azim. [Deg]	L1-C/No [dBHz]	L2-C/No [dBHz]	L1	L2	IODE	URA [m]	Type
120	SBAS	24.41	231.78	38.1	-	C	-	75	N/A	-
124	SBAS	45.79	188.14	41.9	-	C	-	75	N/A	-
126	SBAS	36.35	181.51	40.8	-	C	-	118	N/A	-

Figure 16a. GPS, GLONASS and EGNOS tracking at GNSS/EGNOS permanent station in Bucharest

The tracking data indicate that for this position the elevation angle it is less than 50 degrees for any of the EGNOS satellites and this situation could generate problems in satelllite's tracking especially in urban canyons or small obstacles.

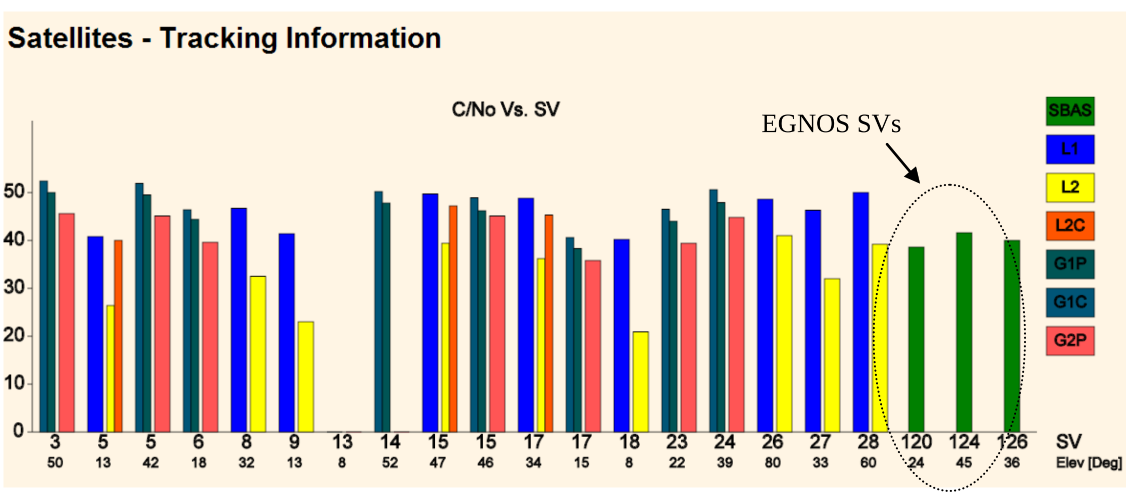


Figure 16b. GPS, GLONASS and EGNOS signal at GNSS/EGNOS permanent station in Bucharest

http://egnos-portal.gsa.europa.eu/discover-egnos/about-egnos
http://www.egnos-pro.esa.int/

Section III: Determination of the Gravity Field

The National Gravity Network of 1st and 2nd order (about 270 points) was observed by the Ministry of Defense – Topography and Cartography Directorate.
Gravity data at the present are not sufficient for the development of an geoid model with an accuracy of 10 cm or better. The EGG97 geoid model available from IAG was purchased by NACLR and tested in order to improve it locally by geometric method (local data and ellipsoidal heights from GPS). A new geometric quasigeoid solution was calculated in 2010 (TUCE Bucharest) based on EGG97 and about 600 ground markers with ETRS89 ellipsoidal heights and normal heights (Black Sea 1975 datum). Further efforts should be done for the modernization of the gravity network. Since 2004 there are no new absolute gravity determination in Romania.
Military Topographic Directorate intended to start an important project with support from NIMA (USA) for gravimetric determinations in Romania. There was planned to be observed more than 17000 points in order to be able to generate a quasigeoid with an accuracy better than 10 cm. Unfortunatey the project was not implemented.

AGEO Project - Astro-geodetic platform for high accuracy geoid determination (acronym AGEO). Financed by Romanian Space Agency - Programme for Research-Development-Innovation for Space Technology and Advanced Research – STAR; Project reference: *Astro-geodetic platform for high accuracy geoid determination (acronym AGEO). This work was supported by a grant of the Romanian National Authority for Scientific Research, Program for research - Space Technology and Advanced Research – STAR, project number 216. Coordinating organization:* Technical University of Civil Engineering Bucharest, Faculty of Geodesy (TUCEB-FG); *Partners:* Astronomical Institute of the Romanian Academy (AIRA), Geogis Proiect s.r.l. *Start date of the project / End date of the project:* 29.11.2013 – 29.11.2015
Short description of the project: Geoid determination and/or validation by CCD astro-geodetic vertical deviations determinations; *Project goal*: Design, perform and test of a mobile platform for astro-geodetic measurement capable to provide real time vertical deviation at a satisfactory precision and low cost by astronomical and geodetic measurements.

Figure 17. Astro-geodetic observations for vertical deviation determination

Objectives:

a. Developing a rigorous mathematical algorithm for astro–geodetic determinations of vertical deviation

b. Designing and testing a cheap, easy to use and a precise mobile observing platform for astro–geodetic determinations of vertical deviation

c. Automation of vertical deviation determination by astro–geodetic measurements, the observing platform being able to provide real time vertical deviation at a satisfactory precision. This objective consists in implementing the mathematical algorithm into dedicated software for astronomical observations guidance, analyzing and controlling.

Estimated results: Efficiency, precision and accuracy increasing of the astro-geodetic determination at cm level or better accuracy for geoid determination.

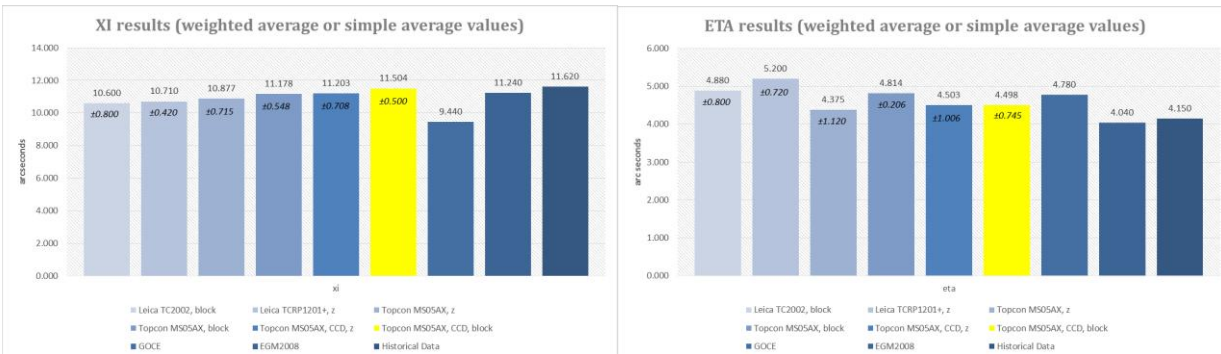


Figure 18. Results of experiments for vertical deviation components (xi, eta)

Section V complements aspects of the gravity observations performed in Romania in the last time.

Section IV: General Theory and Methodology

The theoretical and practical aspects of the Geodesy as geoscience continued the evolution in 2011-2014 time interval. The uniform application of the new standards needed the elaboration of new methodologies for the success of the implementation. At the global level some standards organizations took the responsibility for the geosciences as **ISO (International Standards Organization).** In Romania the counterpart of the ISO it is **ASRO** (Romanian Standardization Association).

The International GNSS Service (IGS), formerly the International GPS Service, is a voluntary federation of more than 200 worldwide agencies that pool resources and permanent GPS & GLONASS station data to generate precise GPS & GLONASS products. The IGS is committed to providing the highest quality data and products as the standard for Global Navigation Satellite Systems (GNSS) in support of Earth science research, multidisciplinary applications, and education. Currently the IGS includes two GNSS, GPS and the Russian GLONASS, and intends to incorporate future GNSS. You can think of the IGS as the highest-precision international civilian GPS community. The IGS global system of satellite tracking stations, Data Centers, and Analysis Centers puts high quality GPS data and data products on line in near real time to meet the objectives of a wide range of scientific and engineering applications and studies.

The IGS collects, archives, and distributes GPS observation data sets of sufficient accuracy to satisfy the objectives of a wide range of applications and experimentation. These data sets are used by the IGS to generate the data products mentioned above which are made available to

interested users through the Internet. In particular, the accuracies of IGS products are sufficient for the improvement and extension of the International Terrestrial Reference Frame (ITRF), the monitoring of solid Earth deformations, the monitoring of Earth rotation and variations in the liquid Earth (sea level, ice-sheets, etc.), for scientific satellite orbit determinations, ionosphere monitoring, and recovery of precipitable water vapor measurements.
The primary mission of the International GPS Service, as stated in the organization's 2002-2007 Strategic Plan, “to provide the highest quality data and products as the standard for global navigation satellite systems (GNSS) in support of Earth science research, multidisciplinary applications, and education. These activities aim to advance scientific understanding of the Earth system components and their interactions, as well as to facilitate other applications benefiting society."
The IGS Terms of Reference (comparable to the by-laws of the organization) describes in broad terms the goals and organization of the IGS. To accomplish its mission, the IGS has a number of components: an international network of over 350 continuously operating dual-frequency GPS and GNSS stations, more than a dozen regional and operational data centers, three global data centers, seven analysis centers and a number of associate or regional analysis centers. The Central Bureau for the service is located at the Jet Propulsion Laboratory, which maintains the Central Bureau Information System (CBIS) and ensures access to IGS products and information. An international Governing Board oversees all aspects of the IGS.
The IGS is an approved service of the International Association of Geodesy since 1994 and is recognized as a member of the Federation of Astronomical and Geophysical Data Analysis Services (FAGS) since 1996.
Romania it is contributing to the IGS with postprocessing data from one GNSS permanent station *(BUCU*) and real time data (project *IGS-IP*).

EUREF is the IAG Reference Frame Sub-Commission for Europe, integrated in the Sub-Commission 1.3, Regional Reference Frames, under Commission 1 – Reference Frames, following the implementation of the new IAG structure at the IUGG (International Union of Geodesy and Geophysics) General Assembly held in Sapporo, 2003.
The Sub-Commission EUREF was founded in 1987 at the IUGG General Assembly held in Vancouver.
EUREF deals with the definition, realization and maintenance of the European Reference Frame - the geodetic infrastructure for multinational projects requiring precise geo-referencing (e.g. three-dimensional and time dependent positioning, geodynamics, precise navigation, geo-information) - in close cooperation with the IAG components (Services, Commissions, and Inter-commision projects) and EuroGeographics, the consortium of the National Mapping Agencies (NMA) in Europe. (www.euref-iag.net)

Romania it is contributing to EUREF/EVRF with GNSS permanent stations and epoch stations, leveling and gravity stations included as mentioned in *Section I*.

EuroGeographics as the central-hub for Europe’s Geographic Information (GI) developments – a unique and diverse network working of all concerned with European GI; National Mapping and Cadastral Agencies (NMCAs), the European Commission and others. The websites contain information of national European Coordinate Reference Systems (CRS) and pan-European Coordinate Reference Systems for position and height. On the sites the following information can be found:
• Description of national Coordinate Reference Systems;
• Description of pan-European Coordinate Reference Systems (ETRS89 / EVRF2000);

• Description of Transformation parameters from national Coordinate Reference Systems to pan-European Coordinate Reference Systems including:

- qualitiy of transformation;
- verification data of transformation;
- possibility for online conversion and transformation of single points for test and verification purposes (position).

• The Joint **Research Centre of the European Commission** jointly organized with Eurogeographics and EUREF two Workshops (Spatial Reference Workshop 1999 and the Cartographic Project Workshop 2000 in Marne-la-Vallee). These Workshops laid the foundations for the definition of uniform European coordinate reference systems in position and height for the unique georeferencing of data. The Information System contains the description of national and pan-European Coordinate Reference Systems (CRS) for position and height orientates on the international standard 19111. It contains also the descriptions of transformations of national Coordinate Reference Systems of European countries to pan-European CRS. In the future a service module will be enabled for the transformation and conversion of coordinates for test purposes.

CRS-EU is a extension and advancement of the former existing and now in this system integrated information system about European Coordinate Reference Systems CRS (http://crs-geo.eu).

According to the international and European standards and recommendations, Romania has adopted or recommends the use of these standards. ***National Agency for Cadaster and Land Registration (NACLR)*** is the main civil public institution involved in the realization of standards and methodologies for cadastre, geodesy, cartography and land registration. NACLR implements the recommendations of the ISO, IGS, EUREF, Eurogeographics and EUPOS. Other Romanian institutions involved in the realization and implementation of geosciences standards are ASRO (Romanian Association for Standardization) and INM (National Institute of Metrology).

- One of the most important standard it is related to the Coordinate and Reference System to be used in Europe. Since 2008 in Romania was introduced ***ETRS89*** for GNSS applications and pan-European cartographic products. This reference system on present situation it is used in parallel with the national reference system S42 (Krasovsky ellipsoid) mainly due to the huge cadastre information who need a long time to be converted to the new reference system.
- The ***INSIPIRE Directive*** of the EU was transposed into national legislation in 2009 and National Spatial Information Infrastructure Committee was created by government decision (no.493/19 May 2010). The Committee it is coordinated by National Agency for Cadastre and Land Registration (NACLR) and includes representatives from all ministries;
- Standards adopted by EUPOS (European Position Determination System) were implemented in Romania for GNSS network (Class A);
- New standards for national reference topographic map at scale 1:5000 were released by NACLR in 2009 and updated (TOPRO 5);
- Standards for scanning and georeferencing of old cadastral maps were adopted and updated;
- Technical standards for digital ortophoto realization at 1:5000 scale were realized based on the twinning project RO 2006/IB/OT–01, PHARE 2006 /018-147.02.01.03;
- New rules were realized and adopted and updated by NACLR for authorization of private and state institutions or persons (from Romania or EU) to realize cadastre works in Romania.
- An important step in implementation of the ETRS89 in Romania was the realization of the ***direct and inverse coordinate transformation between ETRS89 CRS and S-42 CRS.*** *The strategy for coordinate transformation from European Coordinate Reference System (CRS) ETRS89 to national CRS S-42 (Krasovski 1940 – Stereographic 1970 Map Projection) it is*

based on a knowledge of the pattern of distortion data (due to large errors in the survey control network) and it consists of two main steps:

1. *Global datum transformation that is accomplished by a conformal transformation;*
2. *Interpolation of residual coordinate corrections from a grid of coordinate shifts*

The grid of coordinate shifts was generated using least squares prediction method for the distortion modelling between ETRS89 and S-42 which ensures a continuous transformation process that does not destroy spatial relationships established on the national local datum.

In order to provide the compatibility and precise georeferencing of spatial data into the ETRS89 (European Terrestrial Reference System 1989) for the pan-european products, according to the INSPIRE (Infrastructure for Spatial Information in the European Community) directive of the Europe Parliament from 14.03.2007, Naţional Agency for Cadastre and Land Registration (NACLR) provided an Order of the NACLR General Director for adoption of the ETRS89 Coordinate Reference System (CRS) in Romania. The implementation of the ETRS89 in Romania and the actual tendencies of the GNSS satellite technologies applications for the most of the geodetic works required the implementation of an standard algorithm for spatial data transformation from ETRS89 CRS to national CRS (Stereo 1970 projection) and opposite. This situation from Romania, similar with other European or World countries, requires serious problems for spatial data transformation from the old CRS to the new CRS (ETRS89), due to large distortions inside the triangulation networks as effect of the classical datum orientation of the S-42 CRS.

In order to underline the distortions between ETRS89 and S-42 CRS from Romania, there was used an conform orthogonal transformation (2D Helmert), based on a common set of coordintes from both systems. Table 3 presents the statistics of coordinate differences (distortions).

Table 3 – Statistics of coordinate differences for common geodetic points after Helmert 2D transformation (before distortions modeling)

Grid step = 15000 m
No of nodes = 2106

Statistic	East	North
Medium:	0.0000	-0.0000
Standard deviation	0.2648	0.3756
Max.:	0.8466	1.3288
Min.:	-0.8632	-1.1928
Total no. of common points	894	894
No. of points above +/-3*(Std.Dev.):	8	3
% points in +/-3*(Std. Dev.):	99.11	99.66

Statistics situation shows that standard deviation of coordinate differences it is about +/- 0.30 m. The value and the surface disposal can be seen in fig.19 (distortions are presented as vectors).

The big distortions observed in fig.19 should be modelled by a proper technique according to the reality in order to provide a good transformation of spatial data from old datum to the new datum and oposite.

The transformation technique adopted it is similar to the techniques applied in other countries from Europe or abroad and this technique can be implemented also into the GNSS receivers for RTK applications and into the GIS databases for spatial data representation at big scales.

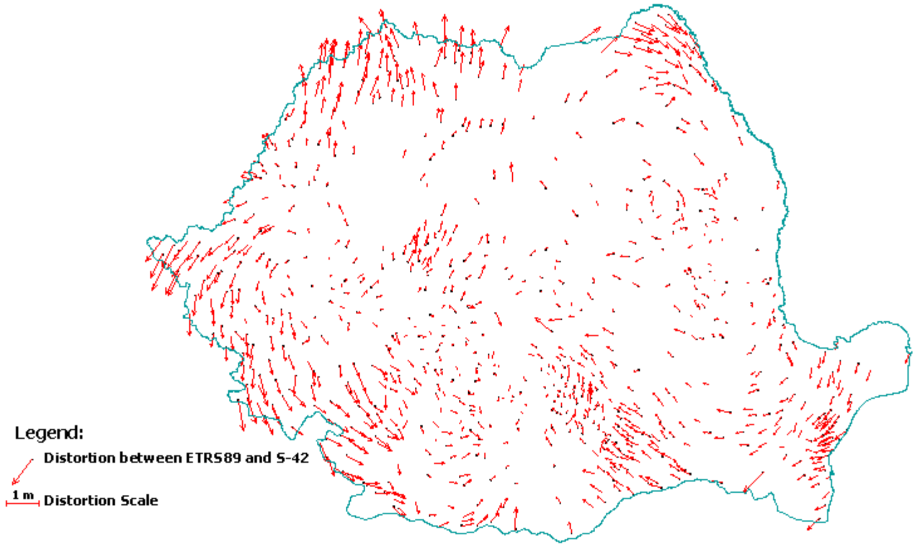


Figure 19. Distortions between ETRS89 and S-42

The existence of common points in a big number and well distributed positions on national surface it is a major requirement for the coordinate transformation from national CRS to the European CRS and oposite. Based on this set of data can be generated the distortion grids and can be predicted the distortions for any interest point in our country. NACLR included in his projects for this year the finalisation of the necessary common set of coordinates by GNSS observations done in triangulation points and of the transformation grid wich will be introduced into the GNSS receivers observing in Romania.

Based on other countries experience in transition from local datums to the new geocetric reference systems (ETRS89, WGS84), we can conclude that the transformation errors and transformation accuracies of points in Romania will be around ±10-15cm, sufficient for the mapping on big scales.

The following table presents the statistic situation of coordinate differences on geodetic common points, available at the present moment, after distorsion modelling.

Table 4 – Statistics of coordinate differences for common geodetic points after Helmert 2D transformation (after distortions modeling)

Grid step = 11000 m
No of nodes = 3816

Statistic	East	North
Medium:	0.0001	-0.0000
Standard deviation	0.0415	0.0456
Max.:	0.1750	0.1644
Min.:	-0.1729	-0.2022
Total no. Of common points	894	894
No. of points above +/-3*(Std.Dev.):	15	18
% points in +/-3*(Std. Dev.):	98.32	97.99

From this statistic situation analysis it can be deduced that the transformation algorithm adopted it is good and can provide precise and fiducial transformation results for all the users.

SELECTED REFERENCES

2011

Romanian National Committee of Geodesy and Geophysics, National Report on Geodetic and Geophysical Activities 2007-2010, XXVth IUGG General Assembly, Melbourne, 28 June -7 July 2011, (http://iag.dgfi.badw.de/fileadmin/IAG-docs/NationalReports2011/Romania.pdf)

T.Rus, "Current status and future of the GNSS network in Romania", Danube Information Services Conference'11", November 9th-10th 2011 Bucharest, Romania (invited lecture)

Ihde, J., Luthardt, J., Boucer, C., Dunkley, P., Farrell, B., Gubler, E., Torres, J., European Spatial Reference Systems, (http://crs-geo.eu /References - Papers And Publications)

ISO/DIS 19111 (Geographic Information – Spatial Referencing by Coordinates) - ICS 35.240.70

2012

BĂDESCU O., PLOPEANU M., DUMITRU P., Geoid modeling by astro-geodetic measurements, GeoCAD 2012 Scientific Conference with International Participation organised by: "1 DECEMBRIE 1918" University of Alba Iulia Topography Department, College of Geoinformatics SZÉKESFEHÉRVÁR Hungary, National Agency for Cadastre and Land Registry - Agency of Alba County, International Federation of Surveyors, University of KAVALA Institute of Technology (TEI) – Department of Landscape Architecture, May 11 - 12, 2012, Alba Iulia, Romania, RevCAD, No 13, 2012, pg. 18-24, Aeternitas Publishing House

Danciu V., Rus T., Moldoveanu C., Aspects of geodetic practice in the area of Vrancioaia Geodynamic Micropolygon, ", International Symposium GeoCAD12, Alba Iulia, May 2012

DUMITRU P., BĂDESCU O., PLOPEANU M., Modeling the Romanian quasigeoid using EGG97 model, GNSS and leveling measurments,, GeoCAD 2012 Scientific Conference with International Participation organised by: "1 DECEMBRIE 1918" University of Alba Iulia Topography Department, College of Geoinformatics SZÉKESFEHÉRVÁR Hungary, National Agency for Cadastre and Land Registry - Agency of Alba County, International Federation of Surveyors, University of KAVALA Institute of Technology (TEI) – Department of Landscape Architecture May 11 - 12, 2012 Alba Iulia, Romania, RevCAD, No 13, 2012, Aeternitas Publishing House

Moldoveanu C., Danciu V., Rus T.,"Data processing possibilities for repeated measurements", International Symposium GeoCAD12, Alba Iulia, May 2012

Rus T., Moldoveanu C., Danciu V., Considerations on the State of Romanian National Geodetic Network, International Symposium GeoCAD12, Alba Iulia, Romania, May 2012

2013

Danciu V., Moldoveanu C., Rus T., *Study concerning estimation of planimetric position and determination of the accuracy in case of extrapolation*, 1st European Conference of Geodesy & Geomatics Engineering GENG '13, Antalya, Turkey, October 8-10, 2013, Recent Advanced in Geodesy and Geomatics Engineering – Conference Proceedings, ISSN 2227-4359 / ISBN 978-960-474-335-3, Antalya, October 8-10, 2013

Dumitru P., Plopeanu M., Jocea A., Calin A., Badescu O., *Geoid Modelling For GIS Applications*, 13th SGEM GeoConference on Informatics, Geoinformatics and Remote Sensing, www.sgem.org, SGEM2013 Conference Proceedings, ISBN 978-954-91818-9-0 / ISSN 1314-2704, June 16-22, 2013, Vol. 1, 411-418 pp, DOI:10.5593/SGEM2013/BB2.V1/S08.015, www.sgem.org

Jocea, A. Calin, M. Plopeanu, P. Dumitru, O. Badescu, *Static Terrestrial 3D Laser Scanning Applications in Civil Engineering Projects*, 13th SGEM GeoConference on Informatics, Geoinformatics and Remote Sensing, www.sgem.org, SGEM2013 Conference Proceedings, ISBN 978-619-7105-01-8 / ISSN 1314-2704, June 16-22, 2013, Vol. 2, 413-420 pp, DOI: 10.5593/SGEM2013/BB2.V2/S09.053, www.sgem.org

Plopeanu M., Dumitru P., Bădescu O., *The vertical atmospheric pressure gradient estimation in the lower terrestrial atmosphere*, GeoCAD 2012 Scientific Conference with International Participation organised by: "1 DECEMBRIE 1918" University of Alba Iulia Topography Department, College of Geoinformatics SZÉKESFEHÉRVÁR Hungary, National Agency for Cadastre and Land Registry - Agency of Alba County, International Federation of Surveyors, University of KAVALA Institute of Technology (TEI) – Department of Landscape Architecture May 11 - 12, 2012 Alba Iulia, Romania, RevCAD, No 13, 2012, Aeternitas Publishing House

Plopeanu M., Dumitru P.D., Badea D., Calin A., Badescu O., *Considerations on the use of CCD and CMOS Sensors in Geodesy*, GEOMAT 2013, Scientific conference with international participation, 200 Years of higher technical education, November 14-16 2013, Iasi, Romania, RevCAD Journal of Geodesy and Cadaster, No.15, 2013, ISSN 1583-2279, pp. 253-260, http://geodesy.hidromed.ro/

Rus T., Moldoveanu C., Danciu V., Kaltchev I., "Geodesy Contribution to the Danube WATER Project" 13th SGEM GeoConference on Informatics, Geoinformatics and Remote Sensing, SGEM2013 Conference Proceedings, ISBN 978-619-7105-01-8 / ISSN 1314-2704, June 16-22, 2013, Vol. 2, 205-213 pp, DOI: 10.5593/SGEM2013/BB2.V2/S09.008

Rus T., Moldoveanu C., Danciu V., Kaltchev I., Implementation Plan of the Activity 6 – on WATER project (MIS 161) funded under Romania-Bulgaria cross border Cooperation Programme 2007-2013 (internal project report, 2013)

Rus T., Moldoveanu C., Danciu V., Kaltchev I., Technical Specifications for the implementation of the Activity 6 – on WATER project (MIS 161) funded under Romania-Bulgaria cross border Cooperation Programme 2007-2013 (internal project report, 2013)

2014

Plopeanu M., Badescu O., Dumitru P., Calin A., Preparation of electronic total stations (and electronic digital theodolites) for optimal astronomical observations, 14th SGEM GeoConference on Informatics, Geoinformatics and Remote Sensing, www.sgem.org, SGEM2014 Conference Proceedings, ISBN 978-619-7105-11-7 / ISSN 1314-2704, June 19-25, 2014, Vol. 2, 387-394 pp, DOI: 10.5593/SGEM2014/B22/S9.049

Rus T., Moldoveanu C., Danciu V., Kaltchev I., "Development of Coordinates conversion and Transformation Standards for the Danube Water Project" 14th SGEM GeoConference on Informatics, Geoinformatics And Remote Sensing, SGEM2014 Conference Proceedings, ISBN 978-619-7105-11-7 / ISSN 1314-2704, June 17-26, 2014, Vol. 2, 205-213 pp, DOI: 10.5593/SGEM2014/B22

2015

Rus T., Moldoveanu C., Danciu V, "Geodetic Achievements for the Danube Water Project" 15th SGEM GeoConference on Informatics, Geoinformatics and Remote Sensing, SGEM2015 Conference Proceedings (in press)

Danciu V, Rus T., Moldoveanu, C., "Study on Achieving a Quasigeoid" 15th SGEM GeoConference on Informatics, Geoinformatics and Remote Sensing, SGEM2015 Conference Proceedings (in press)

http://crs.geo.eu (CRS Portal, BKG, Germany, visited on April 2015)
http://gnss.rompos.ro/spiderweb (GNSS ROMPOS website, visited on April 2015)
http:///www.smartnet.bg (SMARTNET website, visited on April 2015)
http://egnos-portal.eu

Conferences

2011

Danube Information Services Conference'11", November 9th-10th 2011 Bucharest, Romania

XXVth IUGG General Assembly, Melbourne, 28 June -7 July 2011

Geoprevi 2011, Symposium with International Participation, Bucharest, 12-13 May 2011

2012

GeoCAD 2012 Scientific Conference with International Participation organised by: "1 DECEMBRIE 1918" University of Alba Iulia Topography Department, College of Geoinformatics SZÉKESFEHÉRVÁR Hungary, National Agency for Cadastre and Land Registry - Agency of Alba County, International Federation of Surveyors, University of

KAVALA Institute of Technology (TEI) – Department of Landscape Architecture, May 11 - 12, 2012, Alba Iulia, Romania,

2013

1st European Conference of Geodesy & Geomatics Engineering GENG '13, Antalya, Turkey, October 8-10, 2013

13th SGEM GeoConference on Informatics, Geoinformatics and Remote Sensing, www.sgem.org, SGEM2013, June 16-22, 2013, Albena, Bulgaria

GEOMAT 2013, Scientific conference with international participation, 200 Years of higher technical education, November 14-16 2013, Iasi, Romania

2014

14th SGEM GeoConference on Informatics, Geoinformatics and Remote Sensing, www.sgem.org, SGEM2014, June 17-26, 2014, Albena, Bulgaria

GeoPrevi 2015, Symposium with International Participation, Bucharest, 8-9 May 2015

Section V : STUDIES OF GEODYNAMICS

The Institute of Geodynamics has a network of observatories and observation points, equipped with specific sensors. This report contains observations and research from 2011 to 2014 in the frame of the priority theme of the Romanian Academy **“Complex geophysical research in geodynamically active areas with a special concern for the Vrancea seismogenic area”**

During this period, the institute has concentrated its efforts on:

1. Continuous monitoring of local deformations using sensors placed at the level of underground geodynamic observatories (Ursoiu, Crăciuneşti) and of the surface observatory (Căldăruşani)
2. Correlating the crustal deformations with two important geophysical parameters in order to:

a) Understanding the mechanism of response of the crust to the pressure and temperature variations

b) Separating the crustal deformations caused by different causes (earth tides, loads due to rain, snow, etc.).

3. Observing the crustal deformation in the evolution of specific fingerprints of climatic and before major earthquakes.
4. Updating seismic data base of our institute from CSEM using the following legend:

Global earthquakes	Romanian earthquakes
$2 \leq Mag < 3$	$2 \leq Mag < 3$
$3 \leq Mag < 4$	$3 \leq Mag < 4$
$4 \leq Mag < 5$	$4 \leq Mag < 5$
$5 \leq Mag < 6$	$5 \leq Mag < 6$
$6 \leq Mag < 7$	$6 \leq Mag < 7$
$7 \leq Mag < 8$	$7 \leq Mag < 8$
$8 \leq Mag$	$8 \leq Mag$

GEODYNAMIC OBSERVATORIES

As usual, we remind a few important features of geodynamics observatories network coordinated by the Institute of Geodynamics of the Romanian Academy. This network is composed of three polygons: Căldăruşani-Tulnici geodynamic polygon, Crăciuneşti-Deva, Sarmizegetusa-Regia, Padeş-Gorj geodynamic polygon and Delta Dunării – Mangalia geodynamic polygons (Fig.1).

The Geodynamics Observatory Căldăruşani is located in the Romanian Plain (26 ° 16'12" longitude, 44°40'36 " latitude and altitude h = 75 m above), about 40 km N-NE of Bucharest, in a region associated with more active geodynamic stages, and an important fault (Intramoesic fault). The location of the observatory in this area allows the collection of useful information on the effects of the displacement of tectonic compartments, important information for understanding the mechanisms that lead to the accumulation of energy and the earthquakes triggering in the Vrancea region.

The Underground Geodynamic Observatory Ursoiu (22°53'51" longitude and 46°00'43" latitude) is situated at 470 m above sea level, in an old mine shaft, having between 600m and 800m from the entrance to the gallery, rooms with sealed doors to reduce drafts.

The Underground Geodynamic Observatory Crăciuneşti (22°52'28" longitude and 46°00'47" latitude) is located in a disused mine shaft lies just north of Ursoiu observatory in similar geological conditions and altitude.

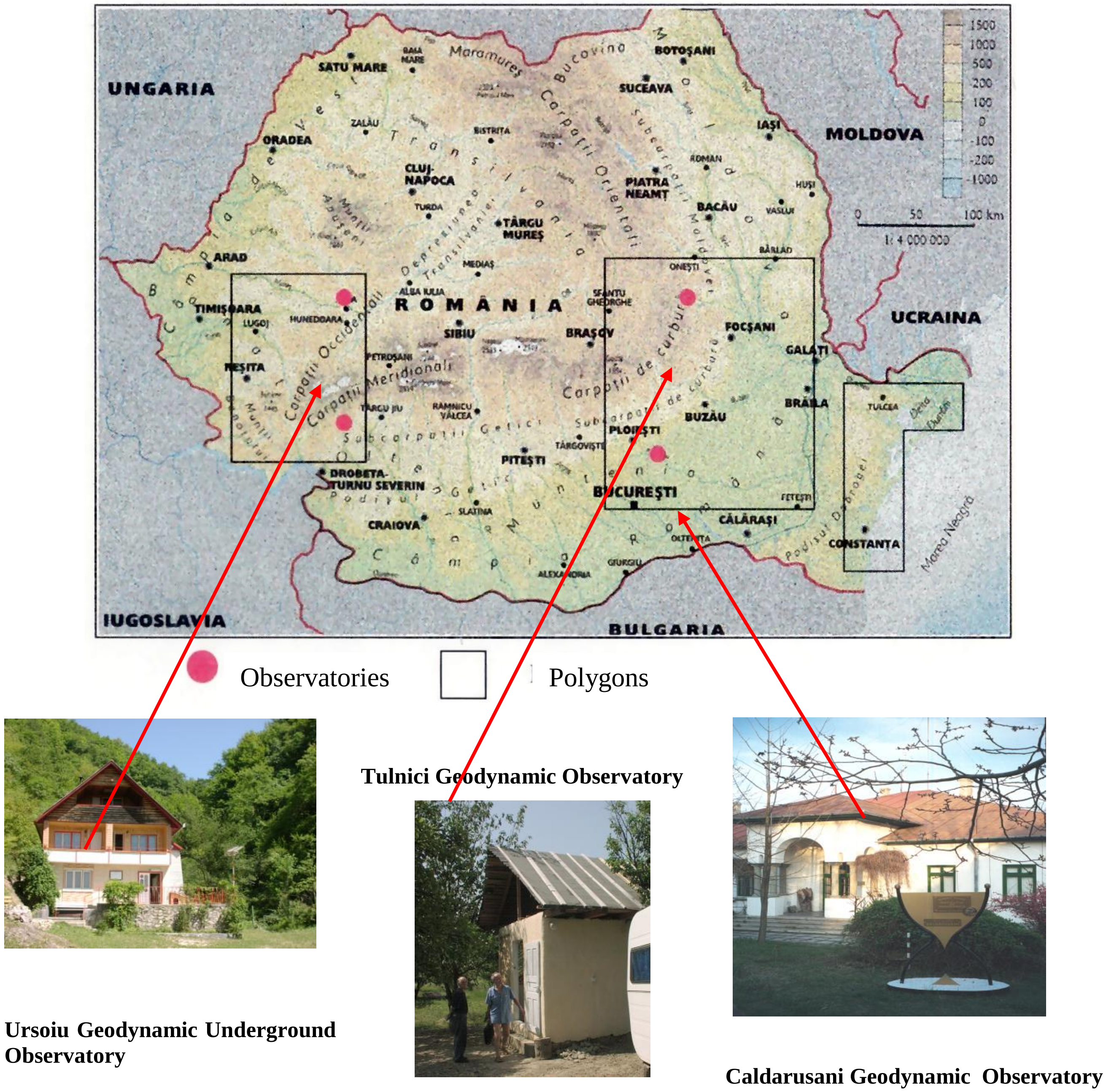


Figure 1. Geodynamic Polygons and Observatories in Romania

GEODYNAMIC SENSORS FOR CRUST DEFORMATION MEASUREMENTS

Analysing the geodynamic phenomena by continuous recording of the crust deformations, indirect measurements were carried out, based on measurements of very small displacements of the sensitive elements from the system measurements. These displacements are measured by the help of displacement sensors which give a variable tension versus monitored displacement.

Water-tube tiltmeters (Figs.2 and 3) have a base of tens or hundreds of meters. For the complete recording of the variations in horizontal plane two clinometers are necessary, perpendicular on each other. Water-tube tiltmeters work in optimal conditions in a mining gallery where the temperature is constant. If the tiltmeters are situated in a location where the temperature has variations over 1^{o}C, the measurement of the temperatures of the two terminals and the application of a temperature correction is necessary. The latter can be theoretically calculated, but it must be verified experimentally, especially in the case of tiltmeters that do not have identical environmental conditions at the two terminals.

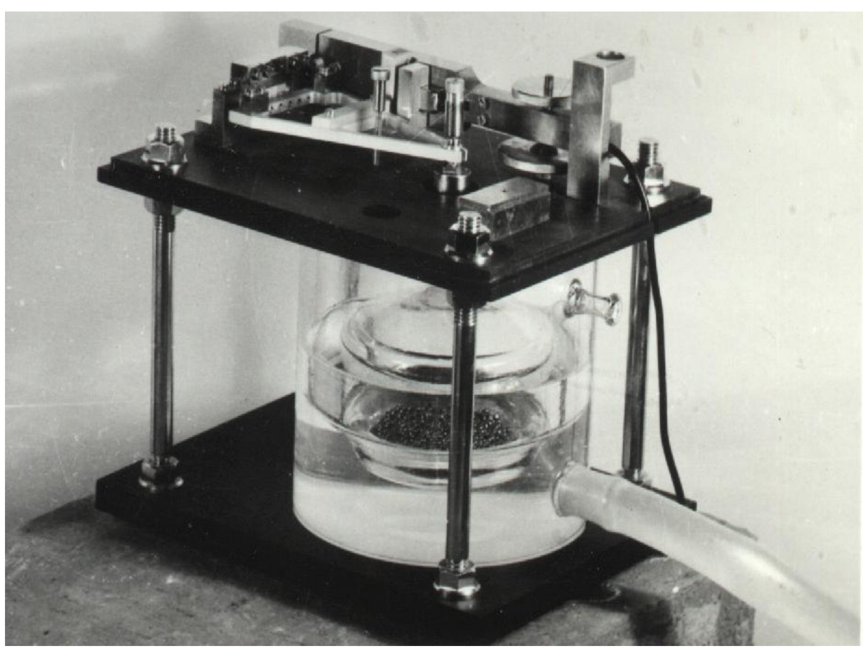


Figure 2. Water-tube tiltmeter (single terminal)

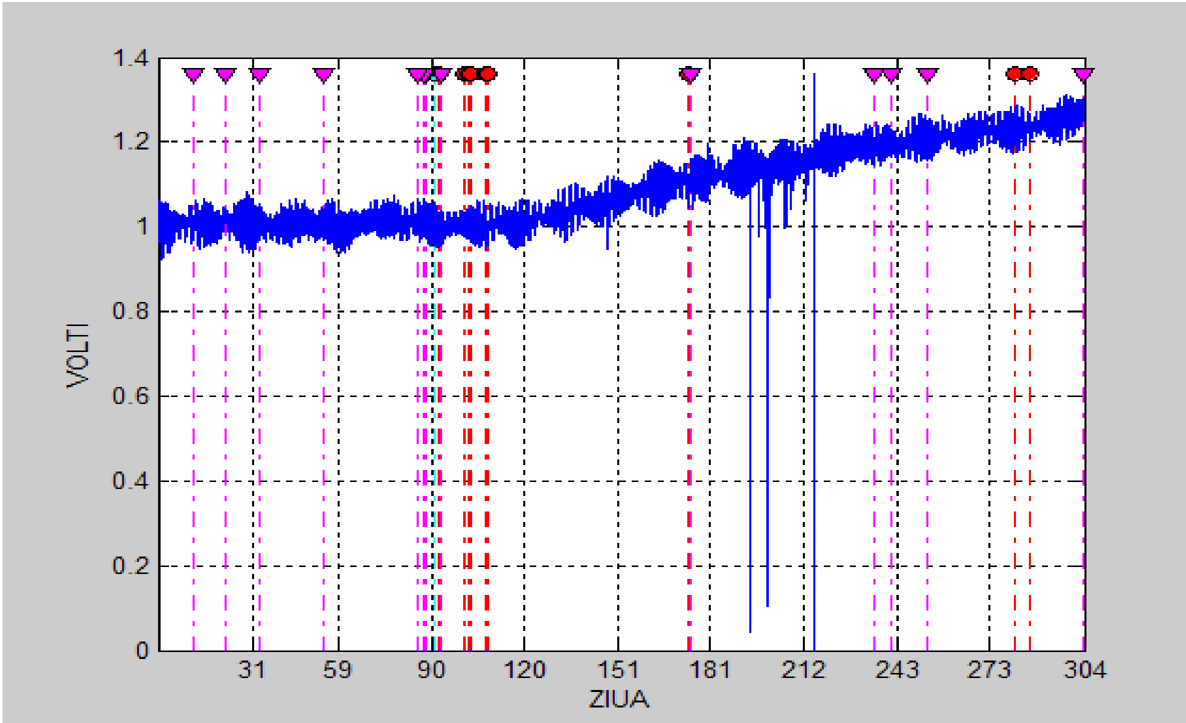


Figure 3. Tiltmeter raw recordings - 2014. URSOIU Geodynamical Underground Observatory

Tiltmeters with vertical pendulum (Fig.4) show the direction of G vector through a normal or inverse pendulum. The length of the pendulum represents the measurement base and is limited from design reasons at values of meters or tens of meters, fact that imposes a high sensitivity of the displacement sensors which are used. One pendulum can record the movement on two perpendicular directions in plane if it is equipped with displacement sensors.

Figure 4. Vertical pendulum

The recording gravimeters (Fig. 5) for observatory are ASKANIA GS11 type. This type of gravimeter was initially designated for the field measurements, using a direct reading, carried out by an operator. The instrument was modified and adapted for a continuous recording, replacing the system for reading with a displacement sensor of high sensitivity. In this way there are carried out continuous recordings of the variations of the intensity of G vector, with a higher sensitivity than the original device. The stability of the recordings was raised, as well, by assembling the instrument in fix location, continuous electric supply and by its maintenance in chambers with small variations of temperature. Gravimeters will be assembled on a concrete pile, very deeply embedded in terrain. The setting in perfect horizontal position has to be done periodically to eliminate the possible modifications of this position meantime, fact that have a sensitive influence over the recordings.

Figure 5. Askania gravimeter

The temperature of the chamber, in which gravimeter is set, must be rather constant for improving the thermostat functioning. This demand will be the best-achieved in underground observatories in which the variation of the temperature is maximum +/- 0.5^0C during one year.

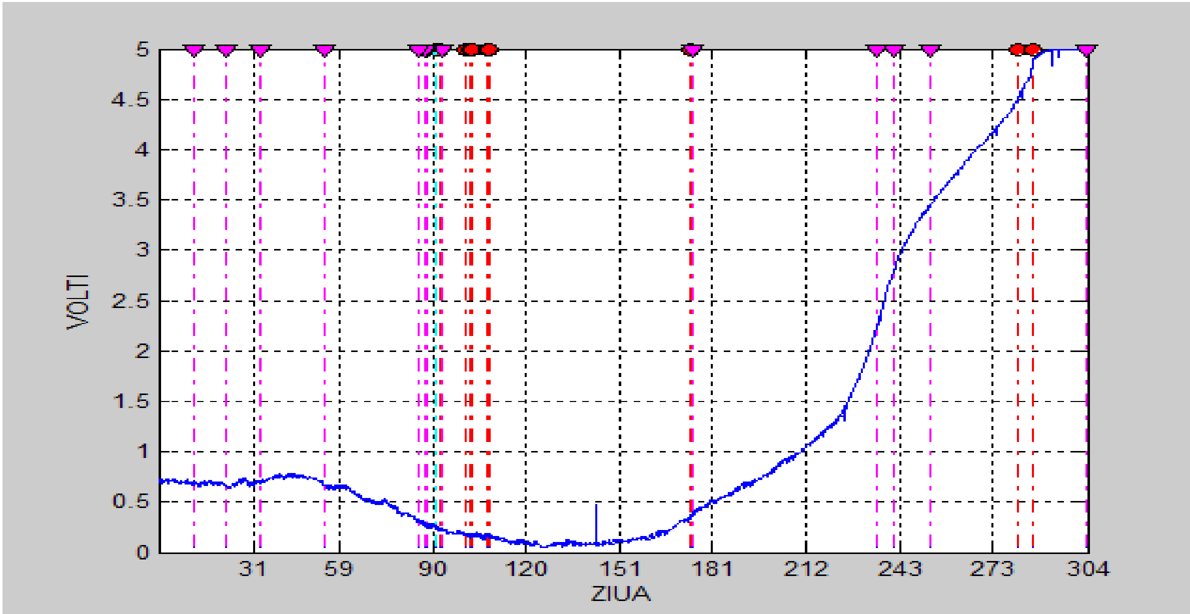


Figure 6. Gravimetric raw recordings - 2014. CALDARUSANI Geodynamical Observatory

At the other observatories the gravimeters are installed in special chambers, thermally insulated, situated in the underground, assuring a slow variation and small amplitude of temperature. In actual conditions the quasi-continuous recordings allow a good observation of the phenomenon of earth tides and allow noticing some anomalies, linked to the local conditions of surface or subsurface.

We have used the north-south and east-west records from tiltmeters, vertical records from Askania gravimeters and the records from temperature and pressure sensors (Fig.7 and Fig.8)

The atmosphere is a complex interface between outer space and Earth's surface on the one hand, and an environment sensitive to its internal processing. From this perspective, atmospheric pressure and temperature are two important parameters whose variations can provide additional information related to the evolution of crustal deformation and, indirectly, subcrustal processes.

The air pressure changes reflected both the effect of temperature variations of the atmosphere, and the result of attraction of the Earth and its external bodies, mainly the moon and sun. In order to quantify these effects, we retained the variations of the atmospheric pressure, of the temperature and of the three directions of the crustal deformation: vertical, north-south and east-west.

ACQUISITION SYSTEM

The electronic systems of acquisition of the data are different, from the professional ones of type National Instruments on 16 bites, with own software Lab View.

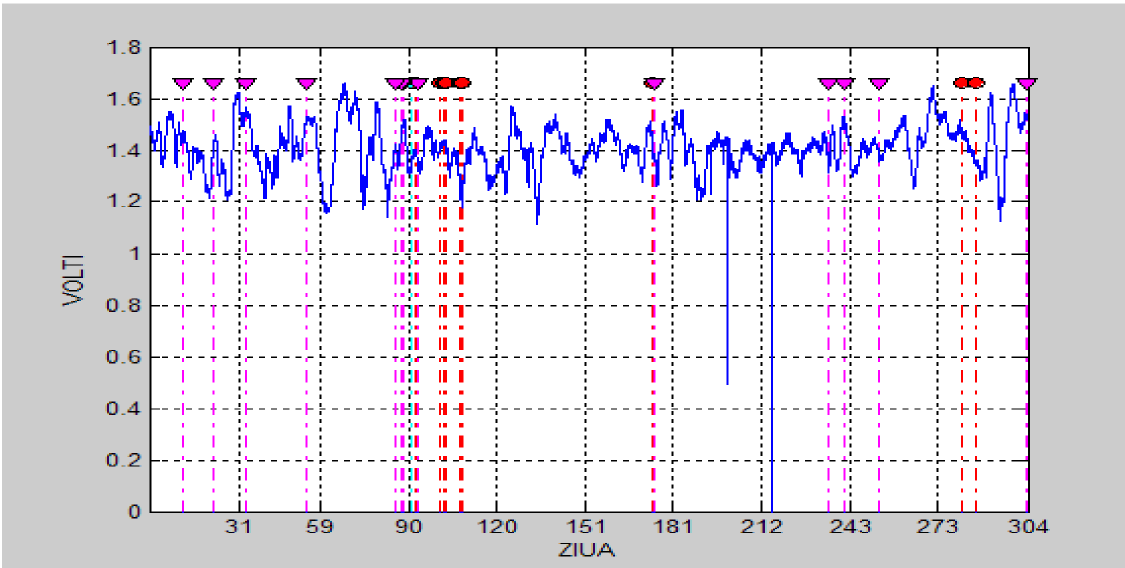


Figure 7. Pressure variations from Ursoiu - 2014.

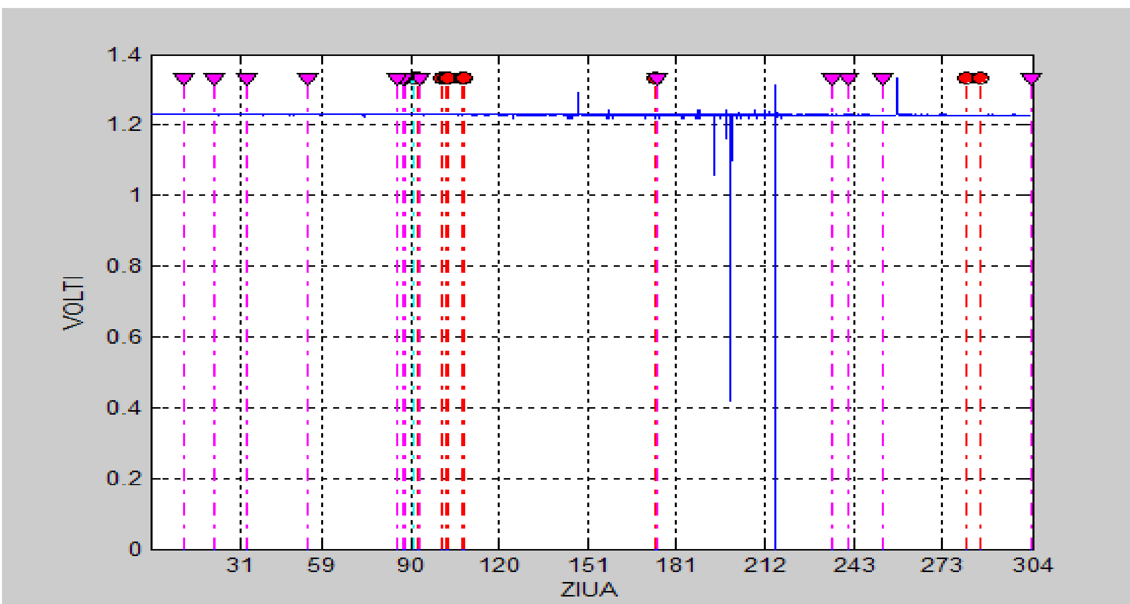


Figure 8. Temperature variations from Ursoiu – 2014

We mention that the existence of a laboratory for calibration and ageing of the geodynamic equipment (LERAG) was necessary in the framework of the activity of research for realizing performing sensors for geodynamics.

THE PRESENCE OF THE PRESSURE VARIATIONS IN THE RECORDS

The study of the of the atmospheric pressure influences on the crustal deformation is not simple. The Earth's atmosphere, defined by highly fluctuating parameters, can be measured and survey only by advanced techniques and a dense network of observation stations. An example is the weather getting harder to do in terms of sudden changes, in terms of the variations of the coefficients of the nonlinear equations in the currently used algorithms.

Variations of different amplitudes and frequencies of some important geophysical parameter can be found in the geodynamical records (Ex: component daytime or semidiurnal). These parameters are: daily temperature variations associated with the corresponding atmospheric pressure variations, earth tides and anthropogenic activity.

We have analyzed by means of the FFT and HICUM methods, the common periods of the atmospheric pressure variations and crust deformation variations recorded by sensors mentioned in Chapter geodynamic observatories.

Processing of the data was done with the MICROGRAPH program and own programs written in MATLAB environment.

We found:

- A band of low frequency corresponding to the relatively random variation of the temperature and to the seasonal periods related to the movement of Earth's revolution around the sun and the rotation axis inclination to the ecliptic;

- A band of frequencies corresponding to diurnal solar attraction of the Moon on air masses and frequencies "daily" due to the Earth's rotation axis;
- A band of frequencies corresponding to the semidiurnal moon-sun attraction.

PHASE VARIATIONS OF THE AMPLITUDE FOR THE M2 EARTH TIDE COMPONENT AT THE LEVEL OF THE GEODYNAMIC OBSERVATORIES FROM ROMANIA.

Earth tides are an important natural phenomenon which causes periodical variations in the gravitational field and deformations of the earth’s interior and earth’s surface. Measurements of the Earth tides provide information on the elastic constants of the Earth (Love numbers). In contrast to earth tides, which can precisely computed, earthquakes are almost unpredictable although some investigations have shown that the elastic properties of rocks may change before earthquakes occur. If the elastic properties of rocks could be monitored it would be, in principle, possible to contribute to earthquake precursory research.

Some parameters of earth tides, as amplitude and phases of their components, are directly related to the elastic properties of rocks. Through the modeling and systematic observations of earth tide parameters related to rock elasticity it should be possible to detect precursors of earthquakes.

But measurements of the deformation of the Earth are generally complex functions of the direct response of the Earth to the deforming forces combined with instrument response, local and regional loading and crustal structure. Finding of the most appropriate method able to provide information about variations of the elastic properties of rocks remains a difficult challenge.

We have chosen to monitor the phase variations of the amplitude for the M2 Earth tide component at the level of the geodynamic observatories from Romania. This is a first step to understand the possible relation between the temporal variations of M2 phase and other local and global important geophysical phenomena (tectonically processes, seismic precursory, etc.). Our methodology is based on HiCum methods applied in sliding windows on the time series of gravimetric and tilt records.

Keywords: earth tides, M2 component, phase, HiCum, sliding windows

MONITORING SEISMIC HAZARD WITHIN SE CARPATHIANS AND THEIR FORELAND

1. GEODYNAMIC SETTING

The seismic map of Romania (Fig. 9) reveals at least two major intriguing aspects: the intense crust seismicity of the SE Carpathians foreland, and the Vrancea intermediate-depth earthquakes (EQs).

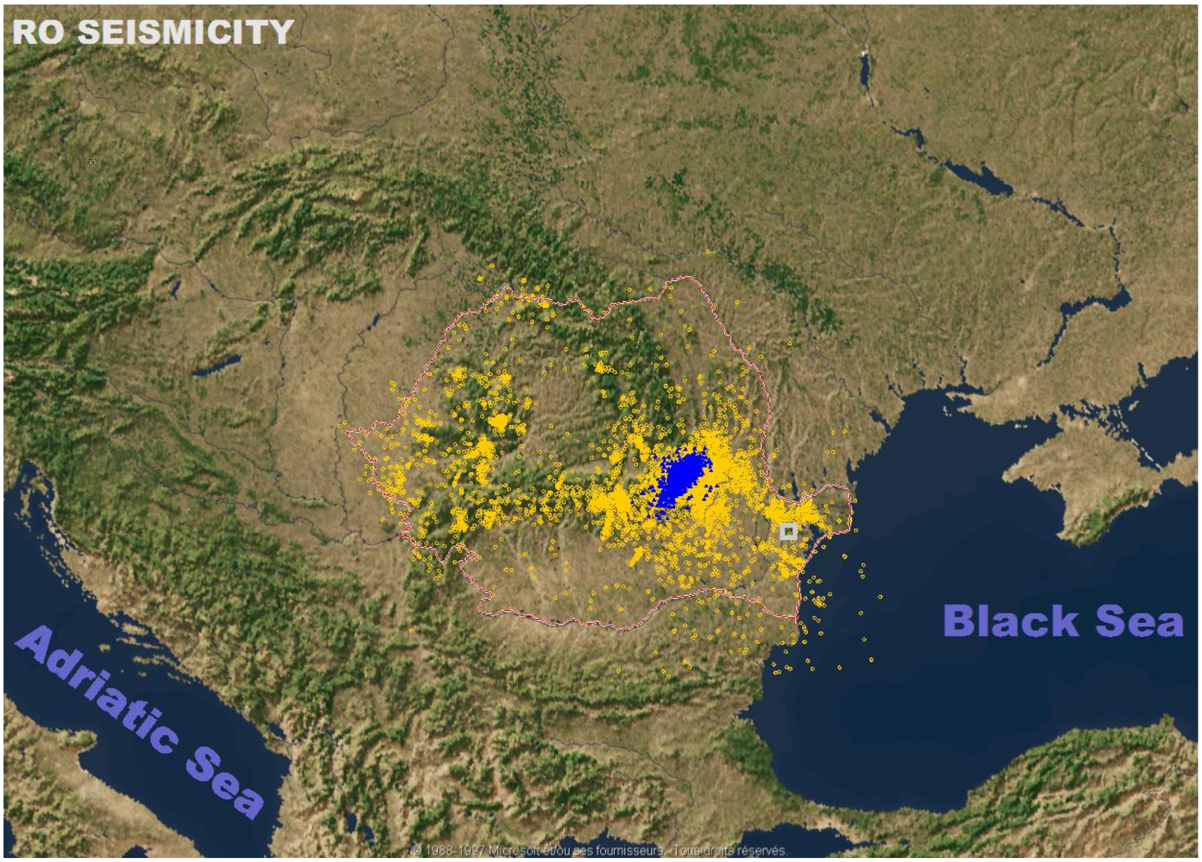


Figure 9. Seismicity map of the Romanian territory. Epicentres according to ROMPLUS catalogue. Yellow circles, epicentres of the crustal earthquakes (EQs); blue dots mark epicentres of the intermediate-depth EQs

Both, the intense craton seismicity and the presence of upper mantle EQs within full intra-continental environment are unusual and hard to explain within current tectonic and geodynamic models, but put a serious threat on the highly dense population living in the area (including Bucharest, the largest city in Romania).

The crustal events within the eastern Moesian Plate (MoP) are related to the existence of several complex fault systems (Fig. 10) created/reactivated by the Black Sea opening (Besutiu, Zugravescu, 2004).

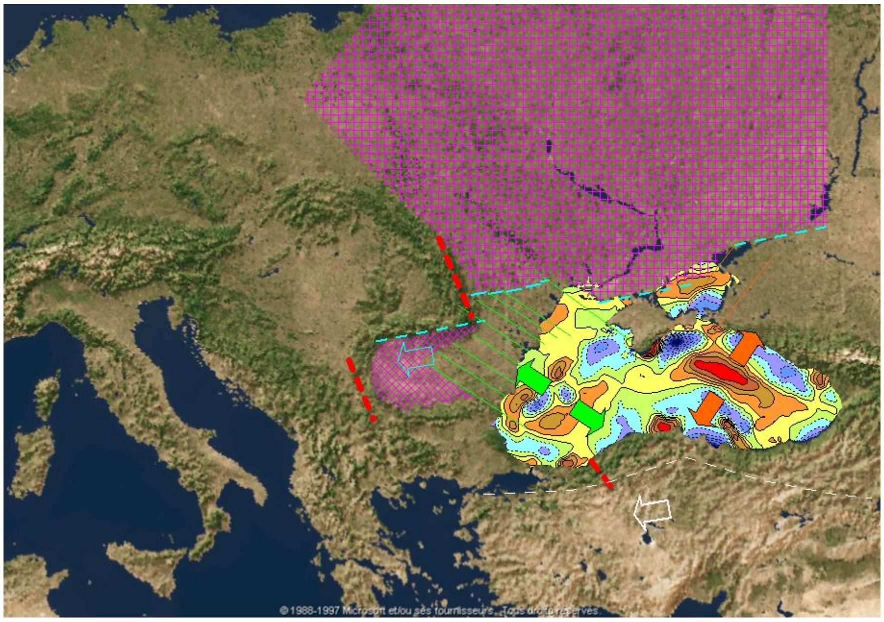


Figure 10. NW trending faults within MoP (green lines) created/reactivated by the lithosphere expelled by the W Black Sea opening. Gravity anomaly trend is coloury shown within the area of the Black Sea. Arrows mark direction of spreading (according to Besutiu and Zugravescu, 2004)

It seems that lithosphere expelled by the W Black Sea basin rift split MoP into several compartments (Fig. 10 and 11), currently pushed north-westward by tectonic forces originating in the SW Arabian Plate (the active rifts in the Red Sea and Aden Bay).

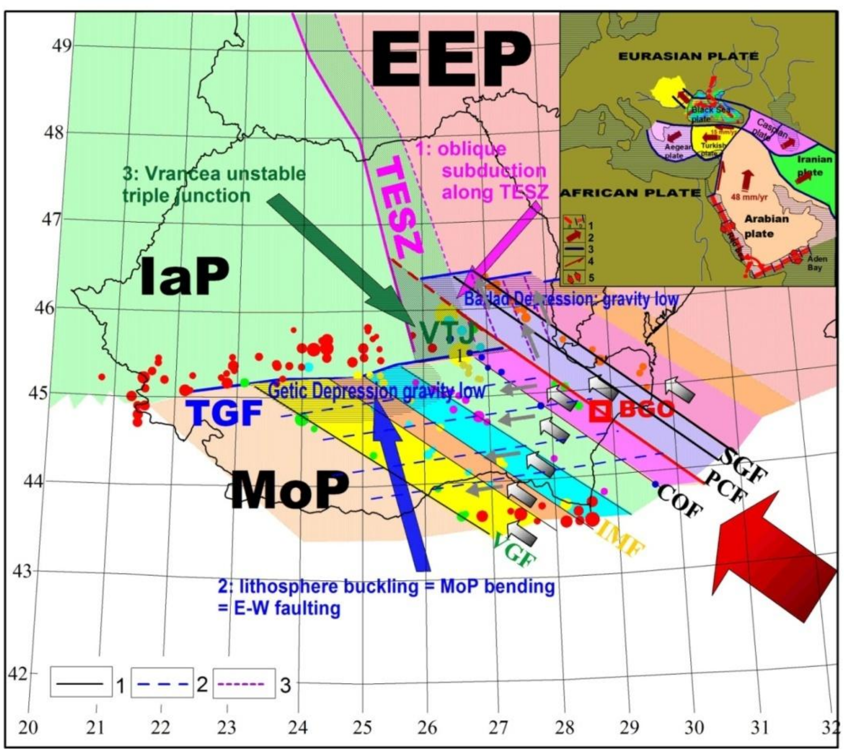


Figure 11. Cartoon showing consequences of the Black Sea opening on the neighbouring inland (according to Besutiu, Zugravescu, 2004)

EEP, East European Plate, IaP Intra-Alpine Microplate, MoP, Moesian Microplate, TESZ, Trans-European Suture Zone, TGF, Trans-Getica Fault, SGF, Sfantu Gheorghe Fault, PCF, Peceneaga-Camena Fault, COF, Capidava-Ovidiu, Fault, IMF, Intramoesian Fault, VGF, Varna-Giurgiu Fault, BGO, Baspunar-Geodynamic Observatory The onset shows dynamics of the plate fragments encompassed between Eurasian and African Megaplates

Generally, these compartments jointly advance towards Carpathians, kept together by friction. However, from time to time, when tectonic forces overpass the frictional threshold, they relatively slip each-other, and may generate crustal events along their wedges, in their upper/brittle part.

Speed excess provided to MoP by W Black Sea opening created the geodynamic environment for Vrancea unstable triple-junction (VTJ), to which intermediate EQs may be associated through thermo-baric accommodation phenomena in the lithospheric compartment sunken into upper mantle (e.g. thermal stress, phase-transform processes). Due to its reverse-host geometry, any intensification of tectonic forces will accelerate the VTJ sinking, and consequently, the increase of seismic energy released by the above-mentioned phenomena.

Therefore, it appears that the increase in tectonic forces acting in the area may lead to an increase of seismic energy released by the both crustal earthquakes occurring in the Carpathian foreland and intermediate events within Vrancea zone.

In order to study the geodynamic processes in the area and related seismic hazard, the Solid Earth Dynamics Department (SEDD) in the Institute of Geodynamics of the Romanian Academy has designed and implemented a special approach mainly based on the study of surface echoes of the deep geodynamic phenomena located in the lithosphere and upper mantle. The infrastructure developed by SEDD for monitoring the above-mentioned geodynamic processes is aimed at revealing increases in tectonic forces that are responsible for the seismicity of the SE Carpathians and their foreland. It mainly consists of two elements:

(i) Baspunar Geodynamic Observatory (BGO), aimed at monitoring changes in tectonic forces acting in the area and their relationship with the crust and intermediate seismicity, and

(ii) Vrancea gravity network (VGN), dedicated to the monitoring of the space-time evolution of the gravity field within Vrancea active geodynamic zone as a consequence of underground mass displacements/reconfiguration.

In the followings, some preliminary results after several years of observations are presented.

2. ATTEMPT TO MONITOR CHANGES IN TECTONIC FORCES THROUGH GEODETIC MEANS: BASPUNAR GEODYNAMIC OBSERVATORY (BGO)

Due to the geodynamic setting of the area encompassed between the Black Sea and East Carpathians, it has been expected that increase in tectonic forces acting from the Black Sea towards the Carpathians may provoke the relative slip of the tectonic compartments in the area and consequent crustal EQs. Monitoring faults activity in the area might indicate changes in tangential tectonic forces. Among numerous faults splitting MoP, Peceneaga-Camena Fault (PCF) has been chosen because (i) it can be accurately outlined because it crops out, and (ii) there is geophysical evidence on its trans-lithospheric extension (e.g. Besutiu, 2006; Besutiu, Zlagnean, 2009). BGO has been built on the Dobrogea segment of the PCF (Fig. 12).

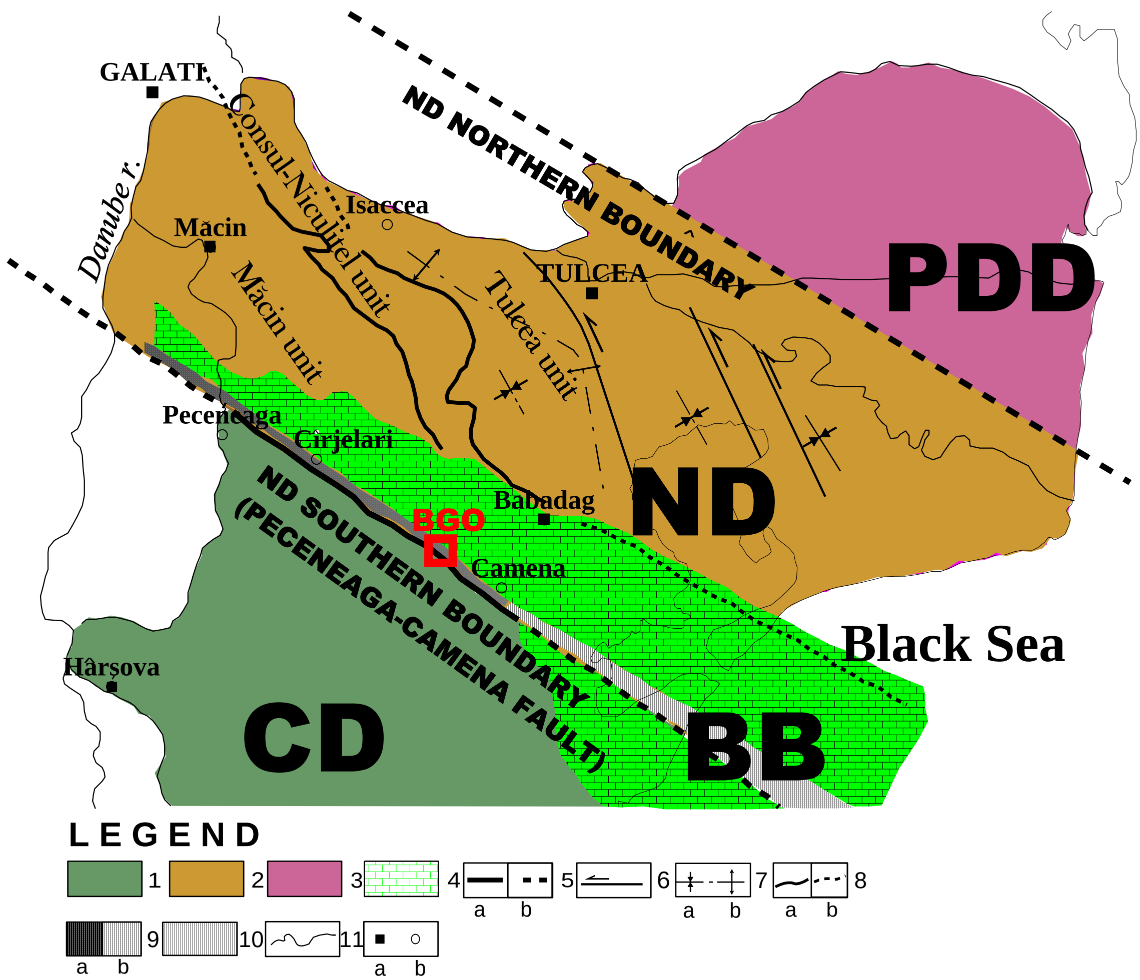


Figure 12. Tectonic setting of the Baspunar Geodynamic Observatory (modified after Gradinaru, 1984)
1, Central Dobrogea (CD); 2, North Dobrogea (ND); 3, Predobrogean Depression (PDD); 4, Babadag Basin (BB); 5, North Dobrogea boudaries: a, cropping out; b, covered; 6, strike-slip faults; 7, structural axes: a, syncline; b, antycline; 8, boundaries between North Dobrogea main units: a, cropping out; b, buried; 9, Carjelari - Camena Formation: a, cropping out; b, covered; 10, episutural post-tectonic cover; 11, river; 12, settlements: a, cities; b, villages

Radon concentration along its track (Cosma et al, 2014) additionally advocates for a large in depth development.

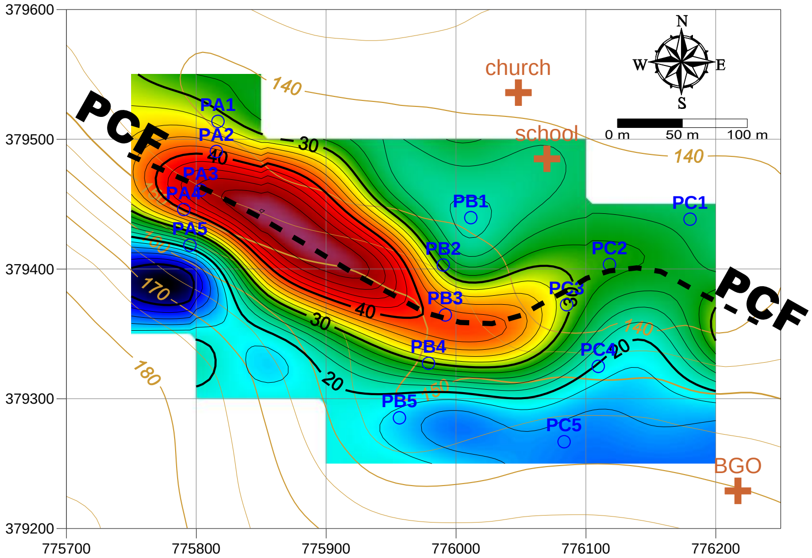


Figure 13. Rn[222] concentration along the PCF track within BGO area (Rn data according to Cosma et al, 2014) Rn concentration are in kBq/m

An overall view of the observatory (Besutiu, et al, 2012) is shown in (Fig. 14).

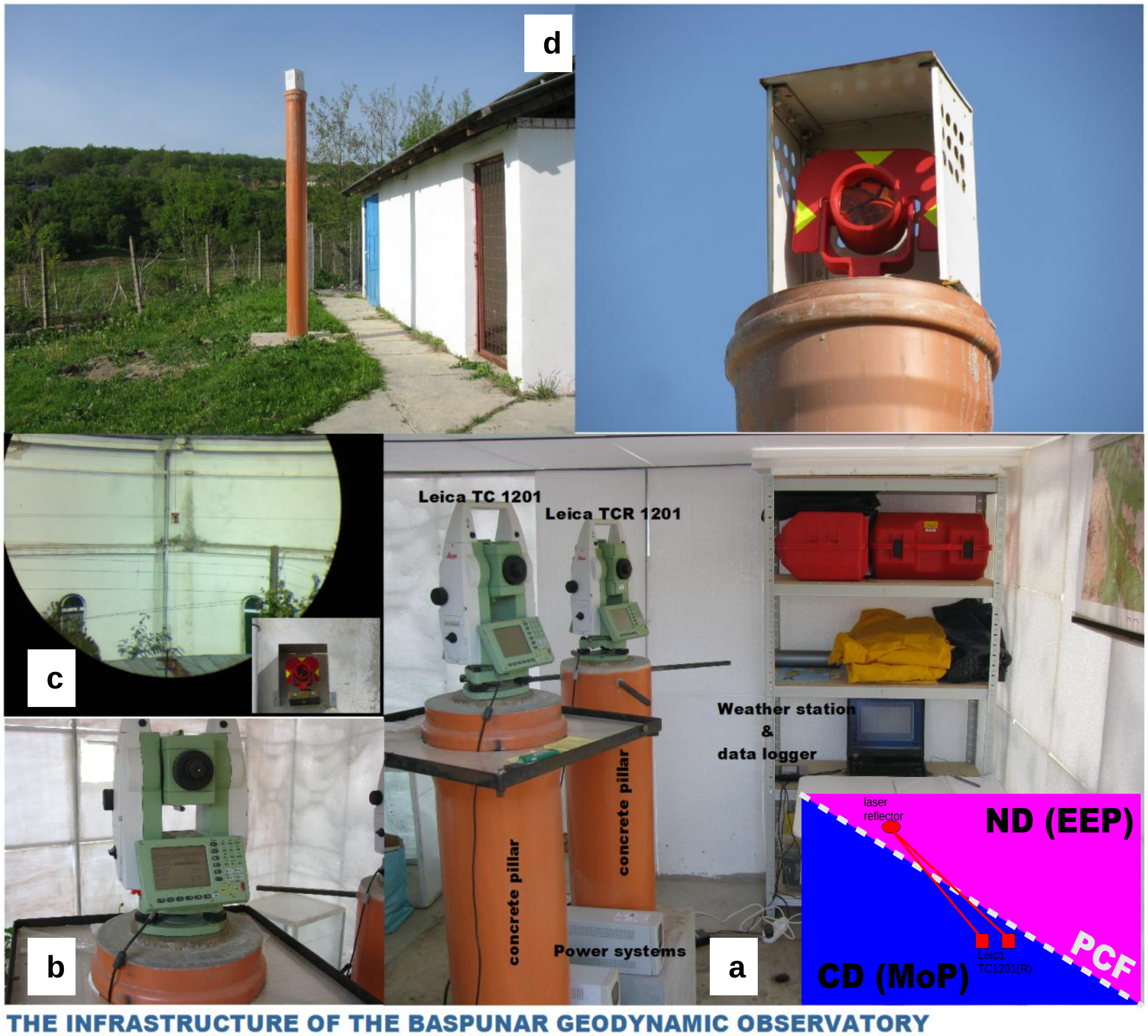


Figure 14. Overall view of the BGO. a, inside view; b, total station pointing a reflector located on: c, wall of the church; d, special pillar. Onset: cartoon showing basic principles in BGO design

It mainly consists of two Leica total stations mounted on a stable steel-reinforced concrete platform (Fig. 15) rooted in the Green Schist series of the Central Dobrogea (MoP basement).

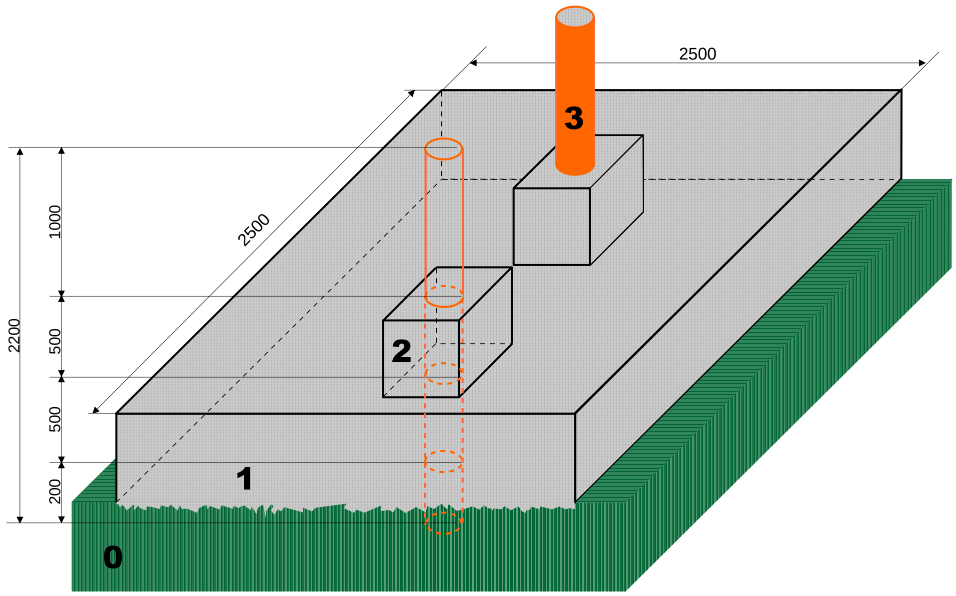


Figure 15. Infrastructure for the deployment of the two total stations at BGO.
0, bedrock (Green Schist series); 1, steel-reinforced concrete platform; 2, additional concrete support; 3 steel-reinforced pillar. All sizes are given in millimetres

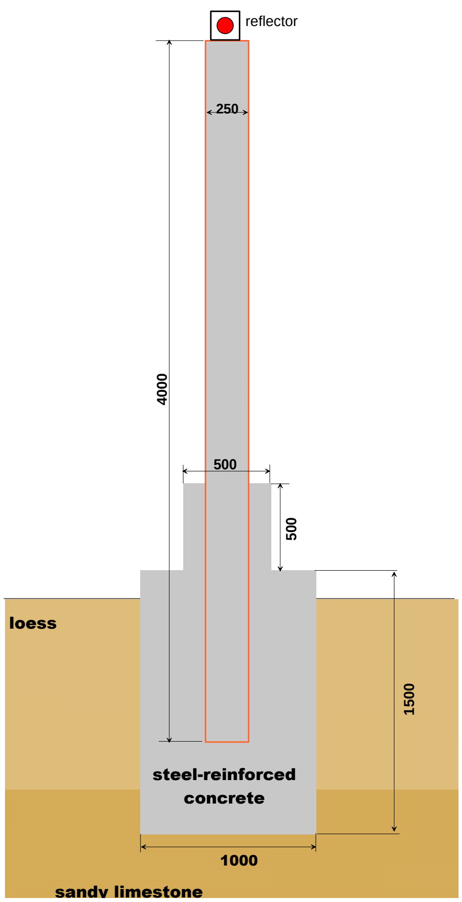


Figure 16. Steel-reinforced concrete pillar to support laser reflector

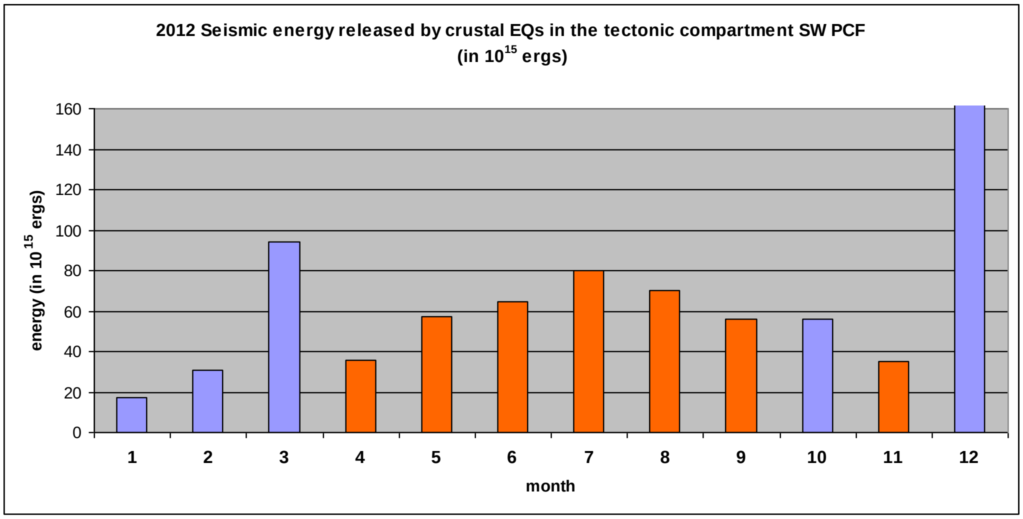
The two laser reflectors (LRs) were placed on the North Dobrogea flank of the PCF, some 300 metres apart from their total stations. One of LRs lies on the wall of the old church of the village, and the other one was firstly installed on the school wall, and then moved on the top of a steel-reinforced concrete pillar placed on the Jurassic sandy limestone of the North Dobrogea unit (Fig. 16). The total stations observe and store the distance between PCF faults every minute. Records are daily sent to the SEDD headquarter in Bucharest, where they are processed for mitigating the influence of the change in atmospheric factors. In order to lower the scattering, a daily average is computed exclusively based on nocturne recorded data. The preliminary records have revealed some interesting aspects:

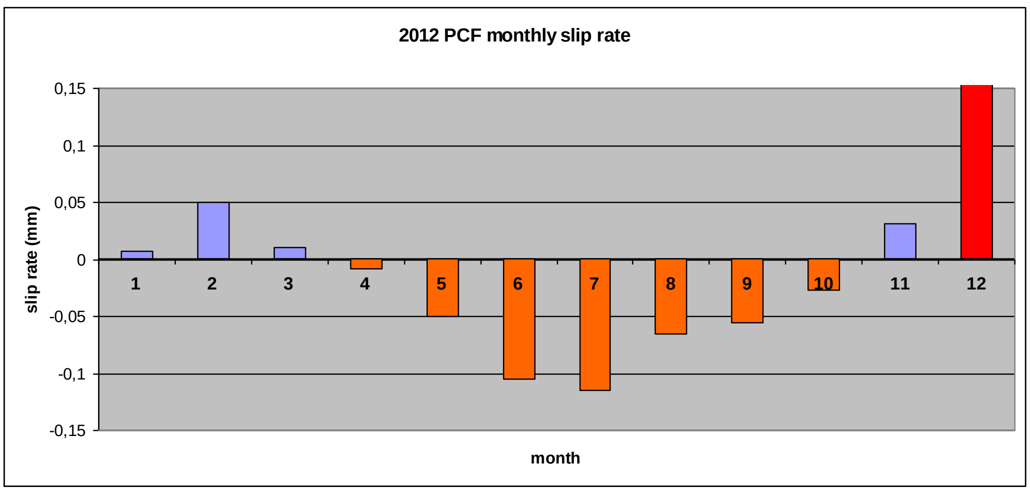
(a) PCF is an active trans-current fault;

(b) it overall behaves as a dextral fault, but some short left-lateral episodes were also revealed;

(c) the slip rate ranges between 1-5 mm/yr with an average amount of about 3 mm/yr, fully consistent with previous micro-tectonic studies results (e.g. Lazarescu, Popescu, 1983)

On the overall, PCF slip looks consistent with the seismicity released within the bending zone of East Carpathians and related foreland (Fig. 17).





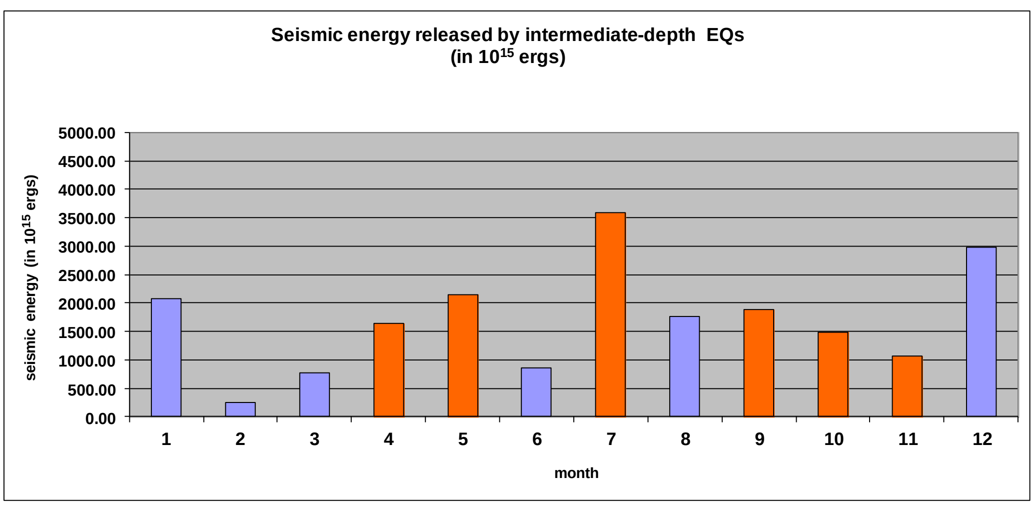


Figure 17. Monthly average of the seismic energy released in the crust of the Carpathians foreland and upper mantle of the Vrancea zone as compared to the monthly average PCF slip rate during 2012 (according to Besutiu et al, 2013)

Figures along X axis mark the rank of the month (e.g. 1 is for January, 2 is for February, and so on)

Prior to intensification of the crust/intermediate seismicity, significant increase of the PCF slip has been recorded. For instance, the Galati-Izvoarele crustal EQs swarm can be associated with a 14 times rise in the PCF slip rate (Fig. 18).

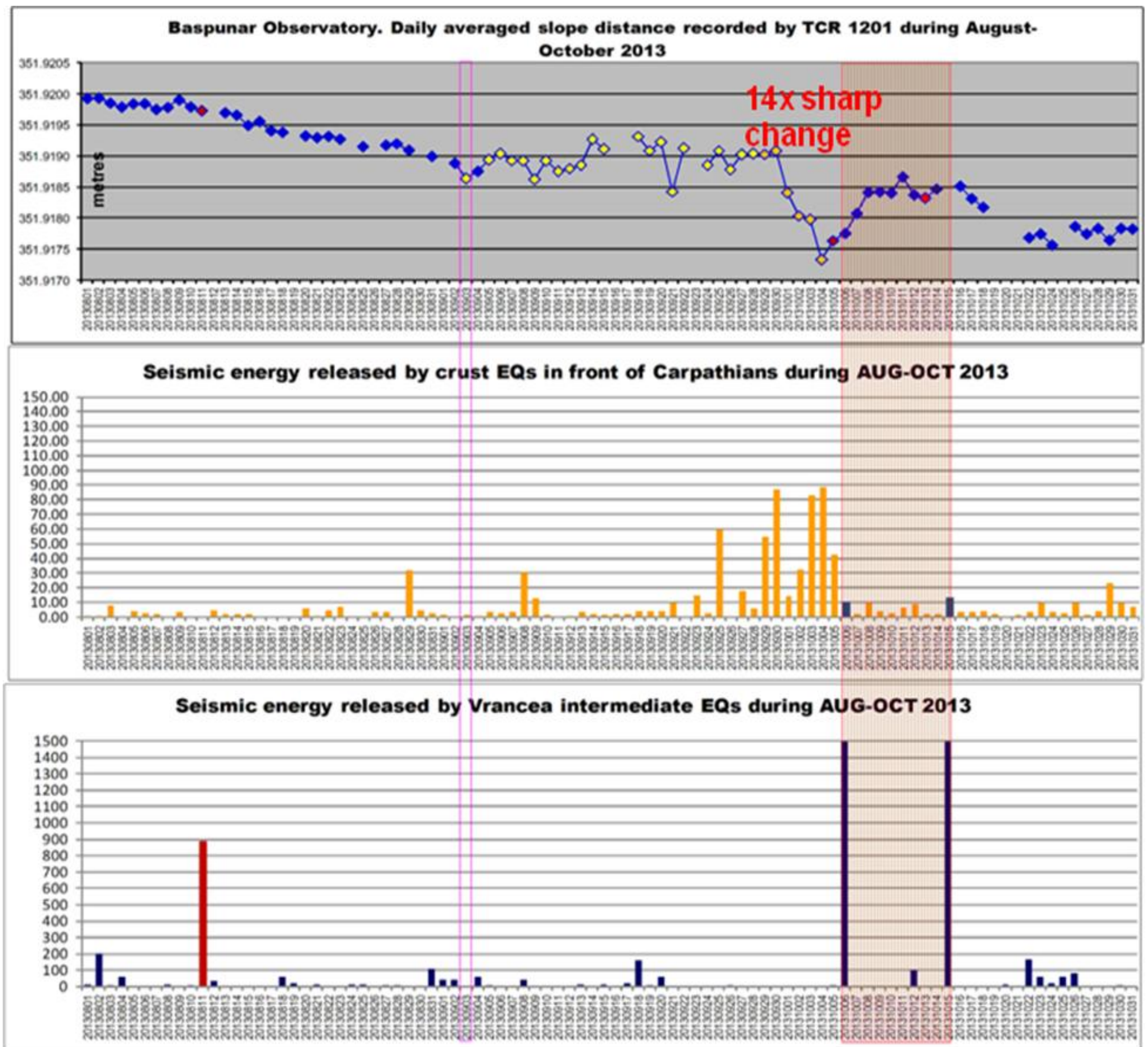


Figure 18. Daily average distance between the PCF flanks, and seismic energy released in front of Carpathians and Vrancea zone during the 2013 Galati-Izvoarele crustal EQs swarm (according to Besutiu et al, 2014)

Figures in abscise mark the days (e.g. 20130801 represents 2013 August, 01), seismic energy is expressed in 10^{15} ergs, and the distance between the fault flanks in metres

Based on the idea that intensification of tectonic forces may provoke slip along major faults within SE Carpathians foreland, the increase of slip observed along PCF may serve as indicator for the ongoing intensification of the both crust and upper mantle seismicity in the area.
It is worth mentioning that, due to the mantle viscosity, a small delay (approx a week) between the PCF slip acceleration and intermediate-depth EQs seems to occur as compared to the crust EQs in front of Carpathians.

3. TENTATIVE GRAVITY APPROACH TO PROVIDE INSIGHTS ON THE DEEP GEODYNAMIC PROCESSES WITHIN VRANCEA ACTIVE SEISMIC ZONE

In order to monitor geodynamic processes the SEDD has designed and implemented a special infrastructure made of several geo-traverses crossing the main lithosphere contacts present on the Romanian territory (Fig. 19).
As it can be noticed, within the Vrancea active seismic zone, a special geotraverse crossing the epicentre area has been added and the network coverage has been especially increased to provide more information on the deep geodynamic phenomena in the lithosphere and upper mantle responsible for the intermediate-depth seismicity in the area.

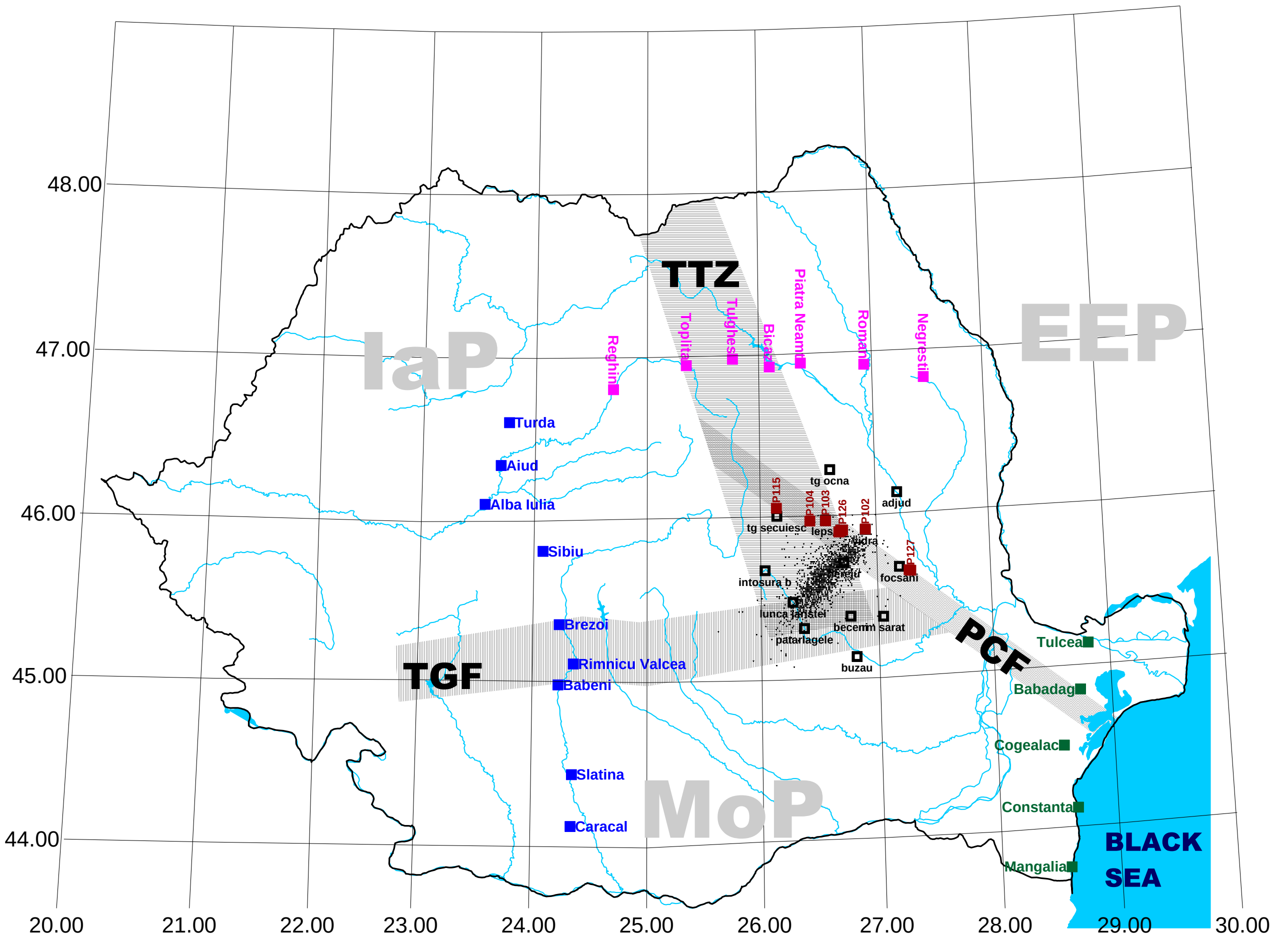


Figure 19. The design of the National Geodynamic Network (NGDN). Variously coloured squares mark location of the epoch stations aalong the network geotraverses

EEP, East European Plate; MoP, Moesian Plate; IaP, Intra-Alpine Plate

TTZ, Trans-European Suture Zone; PCF, Peceneaga-Camena Fault; TGF, Trans-Getica Fault

Black dots mark epicentres of the intermediate-depth earthquakes

Within each base-station of the NGDN, a steel-reinforced concrete pillar (Fig. 20) has been grounded about 1.5 m in depth to offer a stable environment for high accuracy repeated space geodesy and gravity observations. On the top of each pillar a standard CERGOP device for centring GPS antenna has been implemented (Fig. 20C).

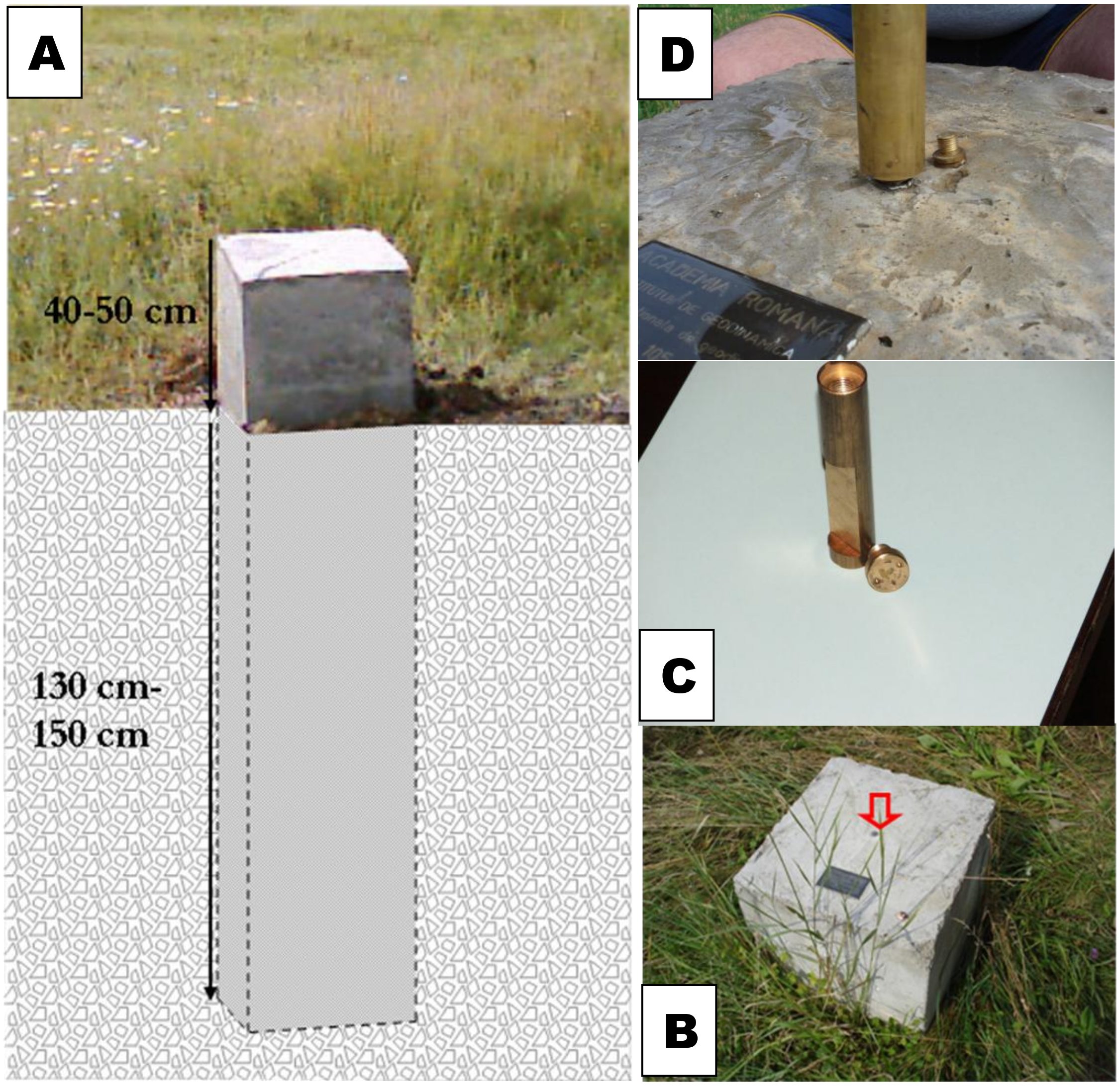


Figure 20. Steel-reinforced concrete pillar (A) within the NGDN base-station. B, red arrow show location of the centring device; C, detail on the CERGOP-standard centring device; D, example of centring the GPS antenna

The infrastructure has been used for systematically conducted space geodesy and, especially gravity observations (Fig. 21)

Figure 21. High accuracy GPS (left) and gravity observations (right) run on the P115 (Sanzieni) pillar of NGDN

Instruments and methodology

Using a Scintrex CG-5 relative meter, absolute gravity values have been transferred and compared on each pillar from the both second order Romanian national gravity reference network and the Central Europe UNIGRACE network. Gravity values on each point have been transferred though the Buzau base-station, located outside the active geodynamic area in a stable environment.

All gravity observations were corrected for tide and drift. Due to the short distance between the stations, corrections for atmospheric pressure change have not been considered.

Preliminary results

Among the first preliminary results, a significant non-tidal gravity decrease of more than 250 μgals over a time span of about 20 years, focused on the epicentre area of the intermediate-depth EQs has been revealed (Fig. 22)

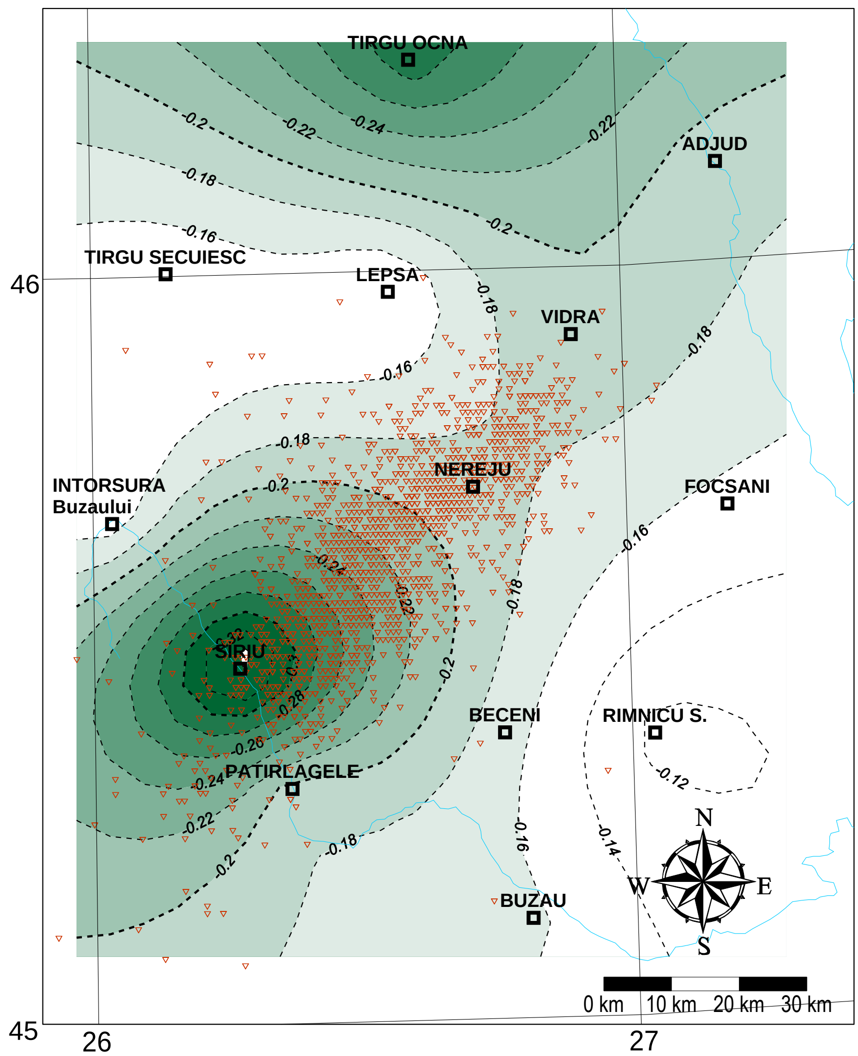


Figure 22. Non-tidal gravity change within Vrancea zone over a time-span of about 20 years.

Squares show location of NGDN base-stations employed in the experiment.

Red triangles mark epicentres of the intermediate-depth EQs.

Gravity contour interval: 0.020 mgals

The results look even more intriguing when compared to the crust deformation. GPS determinations run within the area during the two CERGOP programmes has allowed for revealing a slight relative subsidence over the epicentre area opposite to the overall trend of East Carpathians uprising. This way, the above-mentioned gravity decrease unusually associates with a relative topography subsidence (Fig. 23).

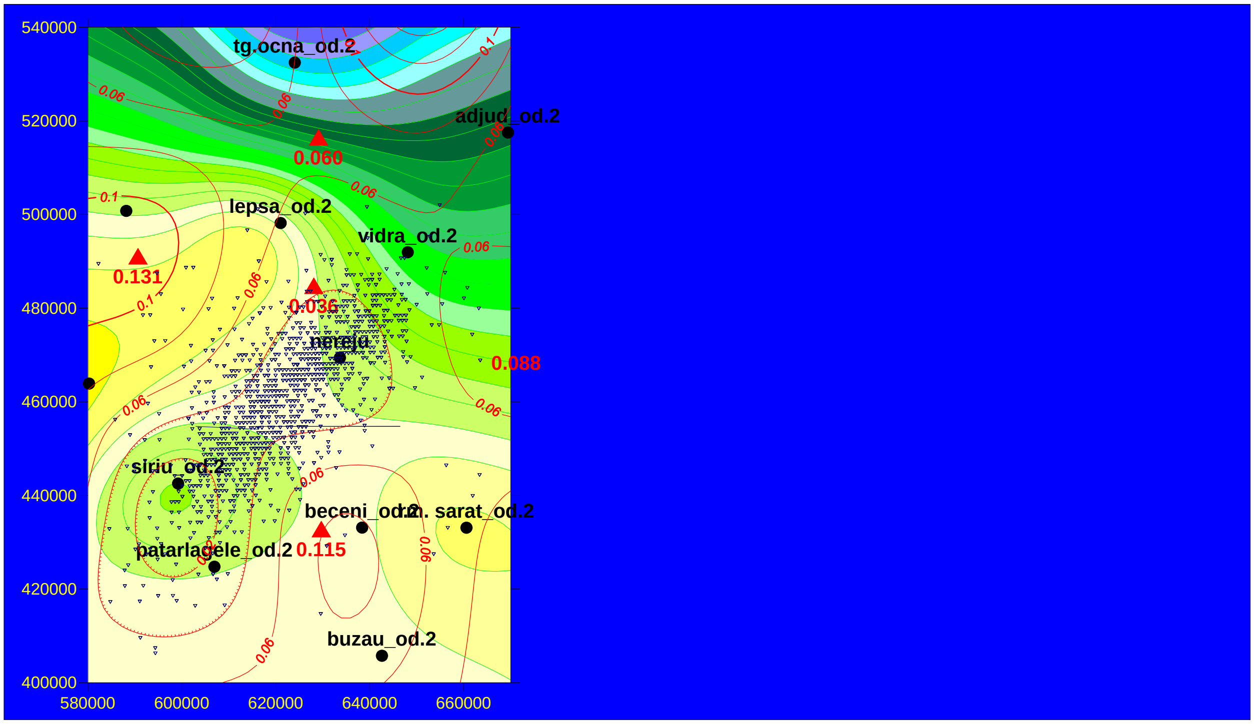


Figure 23. Non-tidal gravity change within Vrancea zone over a time-span of about 20 years (coloured trend) versus crust vertical deformation (red contours) as inferred from GPS data. On the right side of the figure, same situation as illustrated along the red crossing line

Interpretation

The unusual coupling of altitude decrease and gravity lowering looks clearly connected to deep geodynamic processes.

2D and 3D computer models simulating the gravity change have revealed a mass deficit (with the top at approx 10 km depth) located in the epicentre area of the intermediate-depth earthquakes. It has been interpreted in terms of volume increase caused by an assumed lithosphere stretching created by the eclogitization of the lower crust penetrating the upper mantle.

Further monitoring of the area showed the gravity decrease as an ongoing phenomenon.

High accuracy repeated gravity observations within the Vrancea gravity dedicated network clearly revealed the descending trend of the gravity field within all base-stations located in the active geodynamic area (Fig. 24).

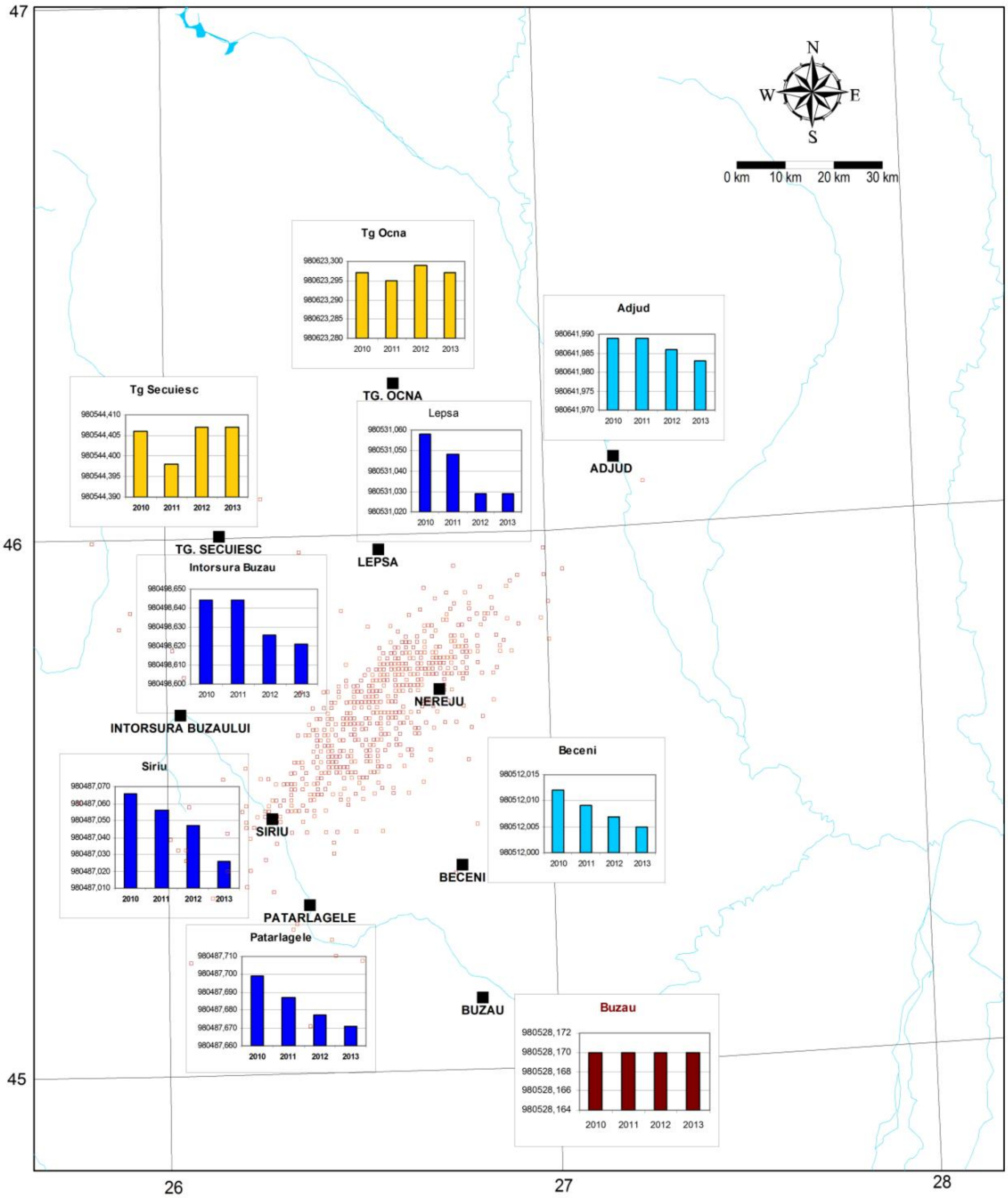


Figure 24. Yearly monitoring of the Vrancea active geodynamic zone. Absolute gravity between 2010 – 2013 as recorded in the base-stations of the Vrancea dedicated network (according to Besutiu et al, 2015)
Red dots mark epicentres of the intermediate-depth earthquakes occurred between 2010-2013

Base stations like Lepsa, Adjud, Beceni, Patarlagele, Siriu, and Intorsura Buzaului exhibited a similar pattern of the gravity change, fully confirming the results of the previously mentioned long-term experiment.

Different field behaviour has been recorded within base-stations located outside the active geodynamic area. There, the yearly observed gravity within the 2010-2013 time-span exhibited a stable or randomly changing behaviour.

It is also worth mentioning that the revealed stability of absolute gravity at the Buzau base-station, chosen as the reference point for the Vrancea network during the experiment supports its appropriate location.

DISSEMINATION OF RESULTS

The researchers of the "Sabba S. Stefanescu" Institute of Geodynamics of the Romanian Academy were present with a lot of scientific communications to prestigious national and international symposia, conferences and workshops. Their scientific activity is also reflected in many papers published in appreciated scientific revues.

International cooperation

Virtual International Laboratory of Geodynamics (2001-to present) - "Sabba S. Stefanescu" Institute of Geodynamics of the Romanian Academy in cooperation with the United Institute of Earth Physics "O. Yu. Schmidt" of the Russian Academy of Sciences

CIPACT 930173-ERB-351 PL 926540 Contract**,** Co-operation Programme between the Royal Observatory of Belgium and the Institute of Geodynamics of the Romanian Academy - studies of the influences induced by earth tides on the geophysical data.

UNESCO Chair in Geodynamics (2004-to present) - Agreement between the United National Educational, Scientific and Cultural Organization and "Sabba S. Stefanescu" Institute of Geodynamics of the Romanian Academy (Romania)

The activity of the UNESCO Chair in Geodynamics "Mihai Drăgănescu" is separately published in the 2nd volume of the series "Planet Earth – the living planet", Zugrăvescu, D., Munteanu, F. (Eds.), Eagle Publishing House, 250 pp., 2011.

Research stages (2011-2012) at the Royal Observatory of Belgium in the frame of a Phd programme on the theme “Studies of the gravimetrical influences induced by earth tides on the intermediate Vrancea seismic activity”

National and international Symposia

2011

Annual Scientific Conference of the Faculty of Physics of the University of Bucharest, Bucharest, June 17, 2011

Cadicheanu Nicoleta., Mitrofan Horia, Anghelache Mirela-Adriana, Marin Constantin & Tudorache Alin, *Appraisal of a well-defined category of earthquakes: the intermediate-depth Vrancea events with NW-SE-striking fault-plane solution*.

2013

17th International Symposium on Earth Tides, „Understand the Earth", Warsaw, Poland, 15-19 April, 2013

Cadicheanu Nicoleta, van Ruymbeke Michel & Zhu Ping, *On the variability of the coupling between some earth tide periodicities and earthquake triggering from three important seismic nest regions on earth*.

NEMO Workshop – Numerical Modelling Using High Performance Computing Infrastructures,

Bucharest, Romania, 10-11 June 2013

Cadicheanu Nicoleta, *Validation of the statistical parameter of correlation between earth tides and earthquakes*

2014

Annual Scientific Session of the Institute of Geodynamics of the Romanian Academy, Bucharest, January 9-10, 2014

Cadicheanu Nicoleta, *Phase variations of the amplitude for the M2 Earth tide component at the level of the geodynamic observatories from Romania.*

5th National Conference on Earthquake Engineering and 1st National Conference on Earthquake Engineering and Seismology, Bucharest, Romania, June 19-20, 2014

Anghelache Mirela-Adriana, Chitea Florina, Mitrofan Horia, Cadicheanu Nicoleta, *Assessing possible effects of earthquakes in terms of groundwater radionuclide pollution in Cernavodă area*

Unesco Chair in Geodynamics (2004-to present) - Agreement between the United National Educational, Scientific and Cultural Organization and "Sabba S. Stefanescu" Institute of Geodynamics of the Romanian Academy (Romania).

The activity of the UNESCO Chair in Geodynamics "Mihai Drăgănescu" is separately published in the 2nd volume of the series "Planet Earth – the living planet", Zugrăvescu, D., Munteanu, F. (Eds.), Eagle Publishing House, 250 pp., 2011.

Research stages (2011-2012) at the Royal Observatory of Belgium in the frame program of a Phd on the theme "Studies of the gravimetrical influences induced by earth tides on the intermediate Vrancea seismic activity"

Selected references

2011

Bemporad, A., **Mierla, M.**, and Tripathi, D. Rotation of an erupting filament observed by the STEREO EUVI and COR1 instruments, Astronomy&Astrophysics, 531, id.A147, DOI: 10.1051/0004-6361/201016297, 2011, FI = 4.41

Capra, L., **Manea V.C., Manea M**., Norini G., The importance of digital elevation model resolution on

granular flow simulations: a test case for Colima volcano using TITAN2D computational routine, *Natural Hazards*, doi: 10.1007/s11069-011-9788-6, FI = 1,357

Demetrescu, C., Tumanian, M., Dobrica, V., Mares, C., Mares, I., Pre-observational evolution of surface temperature in Romania as inferred from borehole temperature measurements, *Pure Appl. Geophys*., DOI: 10.1007/s00024-011-0322-2, 16 pp., 2011, FI = 1.091

Ferrari L., Orozco-Esquivel T., **Manea V., Manea M**., The dynamic history of the Trans-Mexican Volcanic Belt and the Mexico subuction zone. *Tectonophysics*, publicat electronic, FI = 2.585

Gurnis M., Turner M., Zahirovic S., DiCaprio L., Spasojevic R., Dietmar M., Boyden J., Seton M, **Manea V.C**., Bower D.J., Plate tectonic reconstructions with continuosly closing plates, *Computers &Geosciencesm* doi: 10.1016/j.cageo.2011.04.014 , FI = 1.632

Mierla, M., Chifu, I., Inhester, B., Rodriguez, L., and Zhukov, A., Low polarised emission from the core of coronal mass ejections, Astronomy&Astrophysics, 530, L1, DOI: 10.1051/0004-6361/201016295, 2011, FI = 4.41

Mierla, M., Inhester, B., Rodriguez, L., Gissot, S., Zhukov, A., and Srivastava, N., On 3D reconstruction of coronal mass ejections: II. Longitudinal and latitudinal width analysis of 31 August 2007 event, J. Atm. Solar-Terr. Phys. 73, 1166-1172, DOI: 10.1016/j.jastp.2010.11.028, 2011, FI = 1.579

Panaiotu C., **Visan M.,** Tugui A., **Seghedi I.,** Panaiotu A. , Palaeomagnetism of the South Harghita volcanic rocks of the East Carpathians: implications for tectonic rotations and paleosecular variation in the past 5 Ma, Geophysical Journal International, 2011, FI = 2.411

Popa M., Radulian M., **Szakács A**., **Seghedi I**., Zaharia B., New Seismic and Tomography Data in the Southern Part of the Harghita Mountains (Romania, Southeastern Carpathians): Connection with Recent Volcanic Activity. Pure and Applied Geophysics, DOI 10.1007/s00024-011-0428-6, 2011, FI = 1.091

Rodriguez, L., **Mierla, M.**, Zhukov, A. N., West, M., and Kilpua, E., Linking Remote-Sensing and In Situ Observations of Coronal Mass Ejections Using STEREO, Solar Phys 270, 561-573, DOI: 10.1007/s11207-011-9784-8, 2011. , FI = 3.386

Seaton, D. B., **Mierla, M.**, Berghmans, D., Zhukov, A. N., and Dolla, L., SWAP-SECCHI Observations of a Mass-loading Type Solar Eruption, Astrophysical. Journal Let., 727, L10, DOI: 10.1088/2041-8205/727/1/L10, 2011, FI = 5.158

Seghedi I., Permian subaqueous rhyolitic domes changing to surtseyan tuff deposits and subaerial domes: Sirinia Basin (SW Romania-Eastern Europe). *J. Volcanol. Geotherm. Res.* 201, 312-324, 2011, doi:10.1016/j.jvolgeores.2010.07.015, FI = 1.941

Seghedi, I., Downes, H., Geochemistry and tectonic development of Cenozoic magmatism in the Carpathian-Pannonian region. *Gondwana Research* 20, 655-672, 2011, FI = 5.503

Seghedi, I., Maţenco L., Downes, H., Mason, P.R.D., **Szakács, A**., Pécskay, Z., Tectonic significance of changes in post-subduction Pliocene-Quaternary magmatism in the south east part of the Carpathian–Pannonian Region. *Tectonophysics* 502, 146-157, 2011, http://dx.doi.org/10.1016/j.tecto.2009.12.003, FI = 2.509

Srivastava, N., **Mierla, M.**, and Rodriguez, L., On three-dimensional aspects of CMEs, their source regions and interplanetary manifestations: Introduction to Special Issue, J. Atm. Solar-Terr. Phys. 73, 1077-1081, DOI: 10.1016/j.jastp.2011.01.018, 2011, FI = 1.579

Stanica, D., Stanica, D. A., Anomalous pre-seismic behavior of the electromagnetic normalized functions related to the intermediate depth earthquakes occurred in Vrancea zone, Romania, *Nat. Hazards Earth Syst. Sci*., 11, 3151-3156, 2011. doi:10.5194/nhess-11-3151-2011. FI = 1.357

Szakács A., Earthquake prediction using extinct monogenetic volcanoes: A possible new research strategy. *Journal of Volcanology and Geothermal Research*, 201, 404-411,2011, doi:10.1016/j.jvolgeores.2010.06.015, FI = 1.941

Chiricuta, O., I. Chifu, **D. Besliu-Ionescu, M. Mierla**,"Studies of Solar-Terrestrial Connections: Geomagnetic Storms Induced by Coronal Mass Ejections", *Romanian Astronomical Journal*, 2011.

Chitea F., Georgescu P., Ioane D. (2011) Geophysical detection of marine intrusions in Black Sea coastal areas (Romania) using VES and ERT data. *GEO-ECO-MARINA, vol. 17.*

Dumitrache, C., and **Mierla, M.** (2011), Coronal EUV dimming – numerical simulations compared with SOHO observations, JENAM 2008: *Grand Challenges in Computational Astrophysics*, H. Wozniak and G. Hensler (Eds) EAS Publ. Series, 44, pp. 101-105, DOI: 10.1051/eas/1044017, 2011.

Niculae, L. (2011), The role of the neotectonic movements in development of the landforms and the hydrographic network, *Revista Geographica*, TOM XVIII, 2011 (preprint), Institutul de Geografie, Bucureşti.

Niculae, L. (2011), Morphogenesis and morphometric Bâsca Rozilei basin, *Revista Geographica*, TOM XVIII, 2011 (preprint), Institutul de Geografie, Bucureşti

Orlando, A., Zuccarello, F., Romano, P., Zuccarello, F. P., **Mierla, M.,** Spadaro, D., and Ventura, R. (2011), CME evolution and 3D reconstruction with STEREO Data, *Advances in Plasma Astrophysics*, Proc. of the International Astronomical Union, IAU Symp., Vol. 274, pp. 165-167, DOI: 10.1017/S1743921311006831, 2011.

Stanica D.A., Stanica D. (2011), High frequency electromagnetic and DC resistivity monitoring system for near real-time earthquake-induced landslides assessment, *Expanded abstract in SEG Digital Library, Global Mtg. Abs. 15, 26; doi:10.1190/1.3659067*

2012

Bemporad A., Zuccarello F.P., Jacobs C., **Mierla M**., Poedts S., Study of multiple coronal mass ejections at solar minimum conditions”, *Solar Physics*, Online first, DOI: 10.1007/s11207-012-9999-3, FI= 2.77.

Chifu I., Inhester B., **Mierla M.**, Chifu V., Wiegelmann T., First 4D reconstruction of an eruptive prominence using simultaneously three view directions”, *Solar Physics*, Online first, DOI: 10.1007/s11207-012-0107-5, 2012, FI= 2.77 .

Dobrica V., **Demetrescu C**., **Greculeasa R.**, **Isac A.**, On the crustal bias of repeat stations in Romania, *Annals of Geophysics*, 2012, in print. FI = 0.8

Ferrari, L., Orozco-Esquivel, T., **Manea, V.C., Manea, M.**, Review article: The dynamic history of the Trans-Mexican Volcanic Belt and the Mexico subduction zone, *Tectonophysics*, 522-523, p. 122-149, 2012, FI = 2.459

Franco, A., Lasserre, C., Lyon-Caen, H., Kostoglodov, V., Molina, E., Guzman-Speziale, M., Monterosso, D., Robles, V., Figueroa, C., Amaya, W., Barrier, E., Chiquin, L., Moran, S., Flores, O., Romero, J., Santiago, J.A., **Manea, M., Manea, V.C**., Fault kinematics in northern Central America and coupling along the subduction interface of the Cocos Plate, from GPS data in Chiapas (Mexico), Guatemala and El Salvador. *Geophysical Journal International*, 189, 1223-1236, 2012, FI = 1.959

Gurnis, M., Turner, M., Zahirovic, S., DiCaprio, L., Spasojevic, S., Müller, R.D., Boyden, J., Seton, M., **Manea, V.C**., and Bower, D.J., Plate tectonic reconstructions with continuously closing plates, *Computers and Geosciences*, no. 38, pp. 35-42, doi:10.1016/j.cageo.2011.04.014, 2012, FI = 1.714

Kilpua E.K.J., **Mierla M.**, Rodriguez L., Zhukov A.N., Srivastava N., West M., Estimating travel times of coronal mass ejections to 1AU using multi-spacecraft coronagraph data. Proceedings 2012, *Solar Physics* 279, pp.477-496, 2012, FI= 2.77.

Manea, V.C., Manea, M., Ferrari, L., Review Article: A Geodynamical Perspective on the Subduction of Cocos and Rivera plates beneath Mexico and Central America. *Tectonophysics*. Accepted minor revisions, FI = 2.459

Manea, V.C., Perez-Gussinye, M., and **Manea, M**., Chilean flat slab subduction controlled by overriding plate thickness and trench rollback, *Geology*, v.40, no.1, pp. 35-38; doi: 10.1130/G32543.1, 2012, FI = 4.306

Mierla M., Seaton D. B., Berghmans D., Chifu I., De Groof A., Inhester B., Rodriguez L., Stenborg G., Zhukov A. N., Study of a Prominence Eruption using PROBA2/SWAP and STEREO/EUVI Data, *Solar Physics*, Online First, DOI: 10.1007/s11207-012-9965-0, 2012, FI= 2.77.

Panaiotu, C.G., **Visan, M.**, Tugui, A., **Seghedi, I.**, Panaiotu, A. G., Palaeomagnetism of the South Harghita volcanic rocks of the East Carpathians: implications for tectonic rotations and palaeosecular variation in the past 5Ma, *Geophys. J. Int*, doi: 10.1111/j.1365-246X.2012.05394, 2012,FI=2.42.

Popa M., Radulian M., **Szakács A., Seghedi I.**, Zaharia B.: New Seismic and Tomography Data in the Southern Part of the Harghita Mountains (Romania, Southeastern Carpathians): Connection with Recent Volcanic Activity. *Pure and Applied Geophysics* 169, 9, 1557-1573, DOI 10.1007/s00024-011-0428-6, 2012, FI =1.091

Roussev, I., Galsgaard, K., Downs, C., Lugaz, N., Sokolov, I.V., **Moise, E**., Lin, J., Explaining fast ejections of plasma and exotic X-ray emission of the solar corona, *Nature Physics*, 8, 845-849, doi: 10.1038/nphys2427, 2012, FI= 18,96.

Szakács A., Pécskay Z., Silye L., Balogh K., Vlad D., Fülöp A., On the age of the Dej Tuff, Transylvanian Basin, Romania. *GEOLOGICA CARPATHICA,* 63, 138-148, 2012, doi: 10.2478/v10096-012-0011-9, FI = 0,909

Tumanian M, Frezzotti M. L, Peccerillo A., Brandmayr E., Panza G. F. Thermal structure of the shallow upper mantle beneath Italy and neighbouring areas: Correlation with magmatic activity and geodynamic significance, *Earth-Science Reviews*, Volume 114, Issues 3–4, Pages 369–385, http://dx.doi.org/10.1016/j.earscirev.2012.07.002, FI= 6.594.

Veres D., Lane C.S., Timar-Gabor A., Hambach U., Constantin D, **Szakács A.**, Fülling A, Onac B.P., The Campanian Ignimbrite/Y5 tephra layer – A regional stratigraphic marker for Isotope Stage 3 deposits in the Lower Danube region, Romania. *Quaternary International*. http://dx.doi.org/10.1016/j.quaint.2012.02.042. 2012, in press, FI = 1.874

Zuccarello F. P., Bemporad A., Jacobs C., **Mierla M.**, Poedts S., Zuccarello F., The Role of Streamers in the Deflection of Coronal Mass Ejections: Comparison between STEREO Three-dimensional Reconstructions and Numerical Simulations, *The Astrophysical Journal*, DOI: 10.1088/0004-637X/744/1/66, 744, Issue 1, article id. 66, 2012, FI= 6.02.

Mierla M., **Besliu-Ionescu D., Chiricuta O., Oprea C., Maris G.**, Studies of coronal mass ejections that have produced major geomagnetic storms, *Sun and Geosphere*, Vol. 7, p. 12-15, 2012.

Oprea C., Mierla M., Maris G., Earth–directed Coronal Mass Ejections and their Geoeffectiveness during the 2007 – 2010 Interval; proceeding of IAU Symposium 286 – Comparative Magnetic Minima: Characterizing Quiet Times in the Sun and Stars", *IAU Publisher: Cambridge University Press*, Vol. 286, p. 242-245, 2012.

Maris G., Maris O., **Oprea C.**, **Mierla M.**, High Speed Streams in the Solar Wind, proceeding of IAU Symposium 286 – Comparative Magnetic Minima: Characterizing Quiet Times in the Sun and Stars, *IAU Publisher: Cambridge University Press*, Vol. 286, p. 229-233, 07/2012, DOI: 10.1017/S1743921312004887, 2012.

Zuccarello F.P., Bemporad A., Jacobs C., **Mierla M.**, Poedts S., Zuccarello F., The role of streamers in the deflection of coronal mass ejections, proceeding of IAU Symposium 286 – Comparative Magnetic Minima: Characterizing Quiet Times in the Sun and Stars", *IAU Publisher: Cambridge University Press*, Vol. 286, p. 134-138, 2012.

Manea, V.C., Manea, M., Pomeran, M., Besutiu, L., Zlagnean L.: A pararrelized particle tracing code for CFD Simulations in Earth sciences, *Acta Universitaria*, vol 22 (5), 2012, Número de Certificado de Reserva de Derechos 04-2008-100 113 17 1300-102 ISNN 0188-6266

Manea, V.C., Manea, M., Pomeran, M, Besutiu, L., Zlagnean, L.: Computational Fluid Dynamics in Solid Earth Sciences – a HPC challenge. *Acta Universitaria*. In publication. ISNN 0188-6266

Anghelache, M.A., Un punct de vedere geologic asupra patrimoniului construit, *NOEMA*, vol. XI, Comitetul Român de Istoria şi Filosofia Ştiinţei şi Tehnicii, Divizia de Istoria Ştiinţei, Academia Română, Editura Mega, Cluj-Napoca, p. 221 – 243, 2012, ISSN 1841–9852

Niculae, L., Zăbala hydrographic basin – The morphometric analysis of the hydrographic network, *Journal: Aerul şi Apa: Componente ale Mediului* , Vol: 2012, pp. 173-180, Cluj-Napoca, 2012.

Niculae, L., Morfogeneza şi morfometria drenajului bazinului hidrografic Bâsca Rozilei, *Revista Geografică*, T.XVIII-2011, pag.85-90, 2012.

Dobrica V., Demetrescu C., Maris G., Solar wind dynamic pressure and magnetopause stand-off distance before the instrumental era, *Sun and Geosphere*, 7, 45-48, 2012.

Paraschiv A. R., Lacatus D. A., Data Mining the SuprimeCam Archive for Near Earth Asteroids” – Asteroids, Comets, Meteors 2012, *Proceedings of the conference held in May 16-20, 2012* in Niigata, Japan. LPI Contribution No. 1667, id.6235

Paraschiv A. R., Lacatus D. A., Coronal Jet contribution to the Slow Solar Wind Flux, based on STEREO/SECCHI data – procceding acceptat spre publicare in *Advances in Astronomy and Space Physics*.

Paraschiv A. R., Lacatus D. A., Simulating Peculiar X-shaped Extragalactic Radio Sources – procceding acceptat spre publicare in *Advances in Astronomy and Space Physics*.

Berbeleac, I., **Visan, M., Iatan, E., L.**, Neogene gold mineralization occurrences in Voia area, Metaliferi Mountains, Romania, *Romanian Journal of MINERAL DEPOSITS*, Vol. 85, No. 1, p.43-46, ISSN 1220-5648, Geological Institute of Romania, Society of Economic Geology of Romania, Bucharest, 2012;

Berbeleac, I., **Radulescu, V., Iatan, E., L., Visan, M**., Relationships between crustal faults, shallow magmatic chamber and Neogene porphyry Cu-Au systems at Voia, Metaliferi Mts., Romania. *Romanian Journal of MINERAL DEPOSITS*, VOL. 85, No. 1, p.38-42, ISSN 1220-5648, Geological Institute of Romania, Society of Economic Geology of Romania, Bucharest, 2012;

Iatan, E., L., Popescu, C., Gh., Guy, B., Preliminary data on Au-Ag mineralization from Rosia Montana epithermal deposit, Apuseni Mountains, Romania. *European Mineralogical Conference Vol. 1*, EMC2012-p.633, 2012;

Iatan, E., L., Popescu, C., Gh., Preliminary mineralogical data on epithermal ore veins associated with Rosia Poieni porphyry copper deposit, Apuseni Mountains, Romania, *Geophysical Research Abstracts*, Vol. 14, EGU2012-6294-1, 2012, eISSN: 1607-7962, 2012;

Iatan, E., L., Berbeleac, I., Preliminary fluid inclusions study in the Bucium Rodu-Frasin Neogene volcanic structure, Metaliferi Mountains, Romania, *Geophysical Research Abstracts* Vol. 14, EGU2012-6264, 2012, eISSN: 1607-7962, 2012

Ioane D., **Chitea F.**, ERT and VES studies for thermo-mineral water in toplita area, Romania, *Geoecomarina*, nr. 18/2012

2013

Manea, V.C., Manea, M., Ferrari, L., 2013. Review Article: A Geodynamical Perspective on the Subduction of Cocos and Rivera plates beneath Mexico and Central America. Tectonophysics, http://dx.doi.org/10.1016/j.tecto.2012.12.039, FI = 2.684

Nicolae I., **Seghedi I**., Bobos I., M. do Rosário Azevedo, Ribeiro S., **Tatu M**., 2013. Permian volcanic rocks from the Apuseni Mountains (Romania): Geochemistry and tectonic constraints. Chemie der Erde, http://dx.doi.org/10.1016/j.chemer.2013.03.002, FI=1,45.

Panaiotu C.G., Jicha B.R., Singer B.S., Tugui A., **Seghedi I**., Panaiotu A.G., Necula C., 2013. $^{40}Ar/^{39}Ar$ chronology and paleomagnetism of Quaternary basaltic lavas from the Persani Mountains (East Carpathians). Physics of the Earth and Planetary Interiors 221, 1–14, FI=2,383.

Szakács A., **Seghedi I**., 2013. The relevance of volcanic hazard in Romania: is there any? Environmental Engineering and Management Journal 12, 1, 125-135, FI=1,117.

Seghedi I., Ersoy Y. E., Helvacı C., 2013. Miocene–Quaternary volcanism and geodynamic evolution in the Pannonian Basin and the Menderes Massif: A comparative study. Lithos, http://dx.doi.org/10.1016/j.lithos.2013.08.017, FI=3,779.

Harangi Sz., Sági T., **Seghedi I**., Ntaflos Th., 2013. Origin of basaltic magmas of Perşani volcanic field, Romania: A combined whole rock and mineral scale investigation. Lithos, http://dx.doi.org/10.1016/j.lithos.2013.08.025, FI=3,779.

Prelević D., **Seghedi I.**, 2013. Magmatic response to the post-accretionary orogenesis within Alpine – Himalayan belt - Preface. Lithos, http://dx.doi.org/10.1016/j.lithos.2013.09.004, FI=3,779.

Dobrica V., Demetrescu C., Stefan C., Toward a better representation of the secular variation. Case study: the European network of geomagnetic observatories, Earth, Planets, Space, 65, 767–779, doi:10.5047/eps.2012.12.001, 2013, FI = 2,921.

Oprea C., Mierla M., Beşliu-Ionescu D., Stere O., Mariş Muntean G., A study of solar and interplanetary parameters of CMEs causing major geomagnetic storms during SC 23, Annales Geophysicae, 31, 1285-1295, 2013, FI = 1,518.

Feng L., Inhester B., **Mierla M.,** Comparisons of CME Morphological Characteristics Derived from Five 3D Reconstruction Methods, Solar Physics, 282, 1, 221-238, 2013, FI = 3,256.

Halain J.-P., Berghmans D., Seaton D.B., Nicula B., De Groof A., **Mierla M**., Mazzoli A., Defise J.-M., Rochus P., The SWAP EUV Imaging Telescope. Part II: In-flight Performance and Calibration, Solar Physics, 286, 1, 67-91, 2013, FI = 3,256.

Mierla M., Seaton D. B., Berghmans D., Chifu I., De Groof A., Inhester B., Rodriguez L., Stenborg G., Zhukov A. N., Study of a Prominence Eruption using PROBA2/SWAP and STEREO/EUVI Data, Solar Physics, 286, 1, 241-253, 2013, FI = 3,256.

Vaduvescu O., Birlan M., Tudorica A., Popescu M., Colas F., Asher D.J., Sonka A., Suciu O., **Lacatus D., Paraschiv A.**, Badescu T., Tercu O., Dumitriu A., Chirila A., Stecklum B., Licandro J., Nedelcu A., Turcu E., Vachier F., Beauvalet L., et al., 739 observed NEAs and new2-4 m survey statistics within the EURONEAR network, Planetary and Space Science, 85, 299-311, 2013, FI = 2,109

Vaduvescu O., Popescu M., Comsa I., **Paraschiv A., Lacatus D.,** Sonka A., Tudorica A., Birlan M., Suciu O., Char F., Constantinescu M., Badescu T., Badea M., Vidican D., Opriseanu C., Mining the ESO WFI and INT WFC archives for known Near Earth Asteroids. Mega-Precovery software, Astron. Nachr., 334, 718–728. doi: 10.1002/asna.201211720, 2013, FI = 1,399

Veres D., Lane C.S., Timár-Gábor A., Hambach U., Constantin D, **Szakács A**., Fülling A, Onac B.P. (2013) The Campanian Ignimbrite/Y5 tephra layer – A regional stratigraphic marker for Isotope Stage 3 deposits in the Lower Danube region, Romania. Quaternary International. 293, 22-33 http://dx.doi.org/10.1016/j.quaint.2012.02.042**.** FI= 1,874

Szakács A. (2013) G. Groppelli and L. Viereck-Goette (eds.): Stratigraphy and geology of volcanic areas. The Geological Society of America Special Paper, 2010, 464 pages, ISBN 978-0-8137-2464-5 (pbk). Book review. Bulletin of Volcanology, 75, 6, 725, DOI 10.1007/s00445-013-0725-2 FI=2,205

Niculae, L. 2013, The impact of environmental factors on the evolution of the slopes in the Naruja Basin, *Proceedings al Conferintei Aerul şi Apa: Componente ale Mediului, pag. 407-414, ISSN 2067743X*, www.doaj.org, www.scirus.com

Besutiu L., Orlyuk M., **Zlagnean L**., Roments A., **Atanasiu L**., Makarenko I., 2013. Geomagnetic insights on an active tectonic contact: Peceneaga-Camena Fault (*extended abstract*)*; Proceedings of the 5th International Scientific Conference "Geophysical Technologies of Geological Media Predicting and Monitoring", Lvov, Ukraine, 1-4 October 2013, Gheodinamika, 2(15)/2013, pp.100-102, ISSN 1992-142X*

Besutiu L., 2013. Geophysical insights on the structure and geodynamic evolution of the SE Carpathians and related foreland in the context of the Black Sea opening (*extended abstract*); *Proceedings of the 5th International Scientific Conference "Geophysical Technologies of Geological Media Predicting and Monitoring", Lvov, Ukraine, 1-4 October 2013, Gheodinamika, 2(15)/2013, pp.97-99, ISSN 1992-142X*

Saiz E., Cerrato Y., Cid C., **Dobrica V.**, Hejda P., Nenovski P., Stauning P., Bochnicek J., Danov D., **Demetrescu C.**, Gonzalez W.D., **Maris G.**, Teodosiev D., Valach F., 2013, Geomagnetic response to solar and interplanetary disturbances, *J. Space Weather Space Clim*., 3, A26, doi: 10.1051/swsc/2013048.

Stefan C., Dobrica V., Demetrescu C., 2013, On the evolution of geomagnetic activity in the last 300 years. Implications regarding solar wind dynamic pressure and magnetopause standoff distance, *Sun and Geosphere*, 8(1), 7-10.

Greculeasa R. A., Dobrica V., Demetrescu C., 2013, Sources of Geomagnetic Activity at Mid-Latitudes: Case Study – European Observatories, *Sun and Geosphere*, 8(1), 11-14.

Zuccarello F., Balmaceda L., Cessateur G., Cremades H., Guglielmino S. L., Lilensten J., Dudok de Wit T., Kretzschmar M., Lopez F. M., **Mierla M.,** and 8 coauthors, 2013, Solar activity and its evolution across the corona: recent advances, *Journal of Space Weather and Space Climate*, 3, A18.

2014

Cosma C., Cucoş (Dinu) A., Papp B., Begy R., Gabor A., Bican -Brişan N., **Besutiu L.,** Radon implications in life and Earth Science: Baita-Stei and Peceneaga-Camena Fault (Romania). *Carpathian Journal of Earth and Environmental Sciences*, 2014, 9, 2, 15 - 21, ISSN 1842 - 4090, on line ISSN 1844 - 489X, FI = 0.727

Demetrescu, C., Dobrica, V., Multi-decadal ingredients of the secular variation of the geomagnetic field. Insights from long time series of observatory data, *Physics of the Earth and Planetary Interiors*, 231, 39–55, 2014, FI = 2.398.

Kilpua, E.K.J., **Mierla, M.,** Zhukov, A.N., Rodriguez, L., Vourlidas, A., Wood, B., Solar Sources of Interplanetary Coronal Mass Ejections During the Solar Cycle 23/24 Minimum, *Solar Physics*, 289, 10, 3773-3797, 2014, FI = 3.805.

Magdalenic, J., Marqué, C., Krupar, V., **Mierla, M**., Zhukov, A.N., Rodriguez, L., Maksimovic, M., Cecconi, B., Tracking the CME-driven Shock Wave on 2012 March 5 and Radio Triangulation of Associated Radio Emission, *Astrophysical Journal*, 791, 115, 2014, FI = 6.280.

Mitrofan H., Chitea F., Anghelache M.-A., Visan M., Possible triggered seismicity signatures associated with the Vrancea intermediate-depth strong earthquakes (Southeast Carpathians, Romania). *Seismological Research Letters*, 2014, 85, 314-323, FI = 2.268.

Mitrofan H., Marin C., Povară I., Possible conduit-matrix water exchange signatures outlined at a karst spring. *Groundwater*, 2014, doi: 10.1111/gwat.12292, FI = 1.953.

Mitrofan H., Marin C., Tudorache A., **Visan M.,** Diagnosing non-meteorically induced variations in the chemistry of saline springs of the Vrancea seismic area (Romania). *Pure and Applied Geophysics*, 2014, 171, 2315–2338, FI = 1.854.

Naumov V. B., Kovalenker V.A., Damian Gheorghe, Abramov S.S., Tolstykh M. L., V. Yu. Prokofiev, Damian F., **Seghedi I**.. Origin of the Laleaua Alba`´ dacite (Baia Sprie volcanic area and Au-Pb-Zn ore district, Romania): evidence from study of melt inclusions. *Central European Geology, 2014. Vol. 57/1, 83–112*, FI=0.432

Nicolae I., **Seghedi I**., I. Bobos, M. do Rosário Azevedo, S. Ribeiro, **Tatu M.**. Permian volcanic rocks from the Apuseni Mountains (Romania): Geochemistry and tectonic constraints. *Chemie der Erde*, 2014 74, 125–137. FI= 1.397

Papp B., **Szakács A**., Neda T., Frunzetti N., Szacsvay K., Cosma C., Soil Radon And Thoron Activity Concentrations And Co2 Flux Measurements In The Neogene Volcanic Region Of The Eastern Carpathians (Romania). *Carpathian Journal of Earth and Environmental Sciences*, February 2014, Vol. 9, No. 1, p. 261 – 268, FI=0.727

Seghedi, I.; Ersoy, Yalcin E.; Helvaci, Cahit, Miocene-Quaternary volcanism and geodynamic evolution in the Pannonian Basin and the Menderes Massif: A comparative study (vol 180, pg 25, 2013): *LITHOS Volume: 190, Pages: 522-522 Published: MAR 2014*, FI=3.654

Zuccarello, F.P., Seaton, D.B., **Mierla, M.**, Poedts, S., Rachmeler, L.A., Romano, P., Zuccarello, F., Observational Evidence of Torus Instability as Trigger Mechanism for Coronal Mass Ejections: The 2011 August 4 Filament Eruption, *Astrophysical Journal*, 785, 88, 2014, FI = 6.280.

Pirloaga, R., Dobrica, V., The North temperate climate on long-term timescales. Connection to solar variability, *Romanian Journal of Physics*, 2014, submitted, FI=0.745.

Dobrica, V., Demetrescu, C., Mandea, M., Geomagnetic field declination: from decadal to centennial scales, *Journal of Geophysical Research* B, 2014, submitted, FI=3.440.

Bilal Es.d, Guenolé–Bilal Is., Bounahkla M., **Iatan L. E.**, Machado De Mello F., Doumas M., Tahri M., Gallice F., Graillot D., Piegay H., Lassoued N.. The freshwater mussels are a good bioindicator for monitoring the water pollution by heavy metal (the Saint–Victor–Sur–Loire Lake, France), *Banat's Journal of Biotechnology*, (2014)Volume 10, Jul. – Dec, ISSN: 2068—4673, DOI: 10.7904/2068–4738–V(9)–5, "in press" (DOAJ)

Chitea F., Ioane D., Serban A., 2014, Integrated methods for analyzing an area affected by oil and waste water pollution, *14th GeoConference on Science and Technology exploration and mining - Conference Proceedings*, Vol 1, pp 497-504 .

Chitea F., Ioane D., Airinei I., Serban A., Dorobantu A., 2014, Geoelectrical methods applied for prospecting an area with geothermal potential, *14th GeoConference on Science and Technology exploration and mining - Conference Proceedings*, Vol 1, pp 459-466.

Besutiu, L., Orlyuk, M., Zlagnean, L., Romenets, A., **Atanasiu, L.,** Makaraenko, I., 2014, Peceneaga-Camena Fault: Geomagnetic insights into an active tectonic contact. *Geophysical Journal*, 1, 36, 133-144, ISSN 0203 – 3100

Anghelache M.A., H. Mitrofan, F.Chitea, N.Cadicheanu, 2014, Assessing possible effects of earthquakes in terms of groundwater radionuclide pollution in Cernavodă area, *Proceedings of the 5th National Conference on Earthquake Engineering and 1st National Conference on Earthquake Engineering and Seismology: Bucharest, Romania, June 19-20, 2014*, Editura Conspress, 2014, pg. 237-243, [ISBN 978–973-100-342-9]

Anghelache, M.A., 2014, Introducere în cercetarea şi predicţia evenimentelor seismice extreme (exemplificare – marele cutremur din estul Japoniei), *Studii şi comunicări*/DIS, vol. VII, Comitetul Român de Istoria şi Filosofia Ştiinţei şi Tehnicii, Divizia de Istoria Ştiinţei, Academia Română, Editura Mega, Cluj-Napoca, p. 91 - 101. [ISSN 1841–9220]

Moraru, M., 2014, Determinarea structurii solurilor prin metoda imagisticii electrice rezistive*; Studii şi Comunicari*/DIS; Vol. VII, 71-90, ISSN 1844-9220/2014

Niculae L., 2014, Indirect assessment of river-torrential erosion by measuring the eroded volum case study: The Reghiu Stream, vol. *Aerul şi Apa: Componente ale Mediului*, pag. 234-241, ISSN 2067-743X, www.doaj.org, www.scirus.com.

Niculae L., 2014, Determinismul în istoria cercetărilor geografice, *revista COLUMNA*, nr.3/2014, revistă a AsociaţieI cultural-ştiinţifice „Dimitrie Ghika-Comăneşti pag. 379-397, http://columna.crifst.ro, ISSN 2285-4878, ISSN-L 2285-4878.

Niculae L., 2014, Rolul mişcărilor neotectonice în dezvoltarea reliefului şi organizarea reţelei hidrografice, *Revista Geografica*, T.XIX-XXI, 2012-2014, Serie Nouă, Bucureşti, Editura Ars Docende, ISSN 1224-256X.

Seghedi I., Pécskay Z., Onescu P., Petrography, geochemistry and geochronology of selected samples from two banatite intrusions near Gladna Montană, Poiana Ruscă Mountains, Romania, *Romanian Journal of Mineral Deposits*, 2014, 87, 1, 91-95.

Chernyshev I. V., Kovalenker V. A., Chugaev A., Damian G., Damian F., **Iatan L. E., Seghedi I**., 2014, New High-Precision Lead Isotope Analyses of Galena From Romanian Ore Districts and a Review. *Romanian Journal of Mineral Deposits*, 2014, 87, 1, 83-87.

Seghedi I., Tatu M., Permian volcanism in the Sirinia and Presacina basins (South Banat, Romania), *IGCP 575: Pennsylvanian terrestrial habitats and biotas of Southeastern Euramerica*, Bucharest meeting volume, page 7, 2014.

Dobrica, V., Demetrescu, C., Stefan, C., Pirloaga, R., Effects of the solar variability on the North temperate climate, *Romanian Geophysical Journal*, accepted, 2014.

Beşliu-Ionescu, D., Mariş Muntean, G., Lăcătuş, D.A., Paraschiv, A.R., Mierla, M., Detailed Analysis of an Geoeffective Icme Triggered by the March 15, 2013 CME, *Romanian Geophysical Journal*, accepted, 2014.

Stefan, C., Application of the Radon transform to the study of traveling speeds of core geomagnetic field features. Case study – The ~80-year variation, *Romanian Geophysical Journal*, accepted, 2014.

CONFERENCE PAPERS

Besutiu, L. (2011) New considerations on the intermediate depth seismicity of the Vrancea zone: the unstable triple-junction. Geophysical Research Abstracts, Vol. 13, EGU2011-1683-1, 2011, EGU General Assembly 2011

Besutiu, L. (2011) Some seismotectonic consequences of the W Black Sea opening as inferred from geophysical data. 6th Congress of Balkan Geophysical Society - Budapest, Hungary, 3-6 October 2011

Besutiu, L. (2012) New insights on the deep geodynamic processes within Vrancea active seismic zone as inferred from non-tidal gravity changes. Geophysical Research Abstracts Vol. 14, EGU2012-1550, 2012, EGU General Assembly 2012

Manea, C.V, Manea, M., Pomeran, M., Besutiu, L., Zlagnean, L. (2012) High Performance Computing in Solid Earth Sciences, Geophysical Research Abstracts, Vol. 14, EGU2012-12128, 2012, EGU General Assembly 2012

Manea V.C., Manea M., Pomeran M., Besutiu L., Zlagnean L., 2012. *A parallelized tracer code for CFD Simulation in Earth Sciences*, 3rd International Supercomputing Conference in Mexico. Where supercomputing Science and Technologies Meet, S09, Memoria del Congreso. Procesamiento en Paralelo, p. 103

Manea V.C., Manea M., Pomeran M., Besutiu L., Zlagnean L., 2012. Computational Fluid Dynamics in Solid Earth Sciences – an HPC Challenge, 3rd International Supercomputing Conference in Mexico. Where supercomputing Science and Technologies Meet, S09, Memoria del Congreso. Procesamiento en Paralelo, p.107

Besutiu, L., Zlagnean L., Atanasiu, L.,2012 – The geomagnetic mapping of the Romanian Territory in the context of the WDMAM Project, Proceedings of the 7th EUREGEO Congress, Bologna, Italy, Proceedings Volume II, 705-706

Besutiu, L. (2012) Seismic hazard within SE Carpathians and related foreland in the geodynamic context of the Black Sea opening. First International Conference on MOLDAVIAN RISKS - FROM GLOBAL TO LOCAL SCALE, 16-19 May 2012, Bacau, Romania

Pomeran, M., Manea, C.V, Manea, M., Besutiu, L., Zlagnean, L. (2012) CyberDyn: a state-of-the-art supercomputer for geodynamic modelling of actively seismic zones. First International Conference on MOLDAVIAN RISKS - FROM GLOBAL TO LOCAL SCALE, 16-19 May 2012, Bacau, Romania

Besutiu, L., Manea, C.V, Pomeran, M., Zlagnean, L. Manea, M., (2012) Un nou concept în tectonica României: tripla joncţiune instabilă Vrancea între ipoteză si realitate. *Conferinţa Anuală a Societăţii Geologice a României, Bucureşti, 2-4 Noiembrie 2012*

Besutiu L., Orlyuk M., Zlagnean L., Roments A., Atanasiu L., Makarenko I. (2012) Using magnetics in geodynamic studies. Insights on an active tectonic contact: Peceneaga-Camena Fault. GEO-2012 Sesiunea naţională de comunicări ştiinţifice a Facultăţii de geologie si geofizică, 25-26 mai 2012, Bucuresti

Besutiu, L., Zlagnean, L., Plopeanu, M. (2013) An attempt to monitor tectonic forces in the Vrancea active geodynamic zone: The Baspunar experiment; *EGU General Assembly, Vienna, Austria, 05-12 April 2013*

Manea Vlad Constantin, Marina Manea, Mihai Pomeran, Lucian Besutiu, Luminita Zlagnean. (2013) High Performance Computing: a viable solution to boost research for Earth Sciences; *AGU Meeting of the Americas, Cancun, Mexico, 14-17 May 2013*

Manea Vlad Constantin, Marina Manea, Mihai Pomeran, Lucian Besutiu, Luminita Zlagnean (2013). A parallelized particle tracing code for massive 3D mantle flow simulations; *AGU Meeting of the Americas, Cancun, Mexico, 14-17 May 2013*

Manea Vlad Constantin, Marina Manea, Pomeran Mihai, Lucian Besutiu, Luminiţa Zlăgnean - High Performance Computing and Visualization: a viable solution to boost research for Earth Sciences. *NEMO – Numerical Modelling Using High Performance Computing Infrastructures, Bucharest, Romania, 10-11 June 2013*

Manea Marina, Vlad Constantin Manea – Scientific visualization with open source software. *NEMO – Numerical Modelling Using High Performance Computing Infrastructures, Bucharest, Romania, 10-11 June 2013*

Pomeran Mihai, Vlad Constantin Manea, Marina Manea, Lucian Besutiu, Luminiţa Zlăgnean - Code parallelization algorithms. *NEMO – Numerical Modelling Using High Performance Computing Infrastructures, Bucharest, Romania, 10-11 June 2013*

Zlagnean Luminiţa, Lucian Besutiu - Gravity insights on the deep structure of the Vrancea intermediate-depth seismic zone. *NEMO – Numerical Modelling Using High Performance Computing Infrastructures, Bucharest, Romania, 10-11 June 2013*

Besutiu Lucian, Luminita Zlăgnean - Modelling non-tidal gravity changes within Vrancea active geodynamic zone. *NEMO – Numerical Modelling Using High Performance Computing Infrastructures, Bucharest, Romania, 10-11 June 2013*

Manea Vlad Constantin, Marina Manea, Pomeran Mihai, Lucian Besutiu, Luminiţa Zlăgnean – Slab beak-off and mantle flow in the Carpatian region: new insights from 4D numeric models. *NEMO – Numerical Modelling Using High Performance Computing Infrastructures, Bucharest, Romania, 10-11 June 2013*

Besutiu L., Orlyuk M., Zlagnean L., Roments., A., Atanasiu L., Makarenko I. *Geomagnetic insights on an active tectonic contact: Peceneaga-Camena Fault*; *5th International Scientific Conference "Geophysical Technologies of Geological Media Predicting and Monitoring", Lvov, Ukraine, 1-4 October 2013*

Besutiu L. *Geophysical imprints of the geodynamic evolution of Moesia following the Black Sea opening*: Geophysical Research Abstracts, Vol. 16, EGU2014-1008, 2014

Pomeran Mihai, Vlad Manea, Lucian Besutiu, and Luminita Zlagnean: Cyberdyn supercomputer - a tool for imaging geodinamic processes: Geophysical Research Abstracts, Vol. 16, EGU2014-2827, 2014

Besutiu Lucian, Luminita Zlagnean, Raluca Focsaneanu *Geophysical and geodetical insights on the geodynamic setting of the Galati-Izvoarele quake swarm*. Second International Conference on NATURAL AND ANTHROPIC RISKS ICNAR2014, Bacau, ROMANIA, 04-07 June, 2014

Besutiu Lucian, Luminita Zlagnean, Ligia Atanasiu and Raluca Focsaneanu: *Geodynamic considerations on the unusual seismicity of SE Carpathians and related foreland*. 5th Conference on Earthquake Engineering and 1st Conference on Earthquake Engineering and Seismology: Bucharest, Romania, June 19-20, 2014

Besutiu Lucian, Luminita Zlagnean, *Infrastructure for monitoring geodynamic processes and related seismic hazard within SE Carpathians*: Book of Abstracts, 17-18. 10th Edition of the Environmental Legislation, Safety Engineering and Disaster Management, ELSEDIMA, International Conference, Cluj-Napoca, ROMANIA, September 18th-19th, 2014

Besutiu L., Zlagnean L. *Monitoring deep geodynamic processes within Vrancea intermediate-depth seismic zone by geodetic means*, Geophysical Research Abstracts, Vol. 17, EGU2015-1630-1, 2015, EGU General Assembly 2015

PAPERS

Besutiu L. (2013) *Geophysical insights on the structure and geodynamic evolution of the SE Carpathians and related foreland in the context of the Black Sea opening* (extended abstract); Proceedings of the 5th International Scientific Conference "Geophysical Technologies of Geological Media Predicting and Monitoring", Lvov, Ukraine, 1-4 October 2013, Gheodinamika, 2(15)/2013, pp.97-99, ISSN 1992-142X

Besutiu, L. (2009) *Geodynamic and seismotectonic setting of the SE Carpathians and their foreland*: in Besutiu, L. (Ed.) *Integrated research on the intermediate depth earthquakes genesis within Vrancea zone:* in Besutiu, L. (Ed.) Integrated research on the intermediate depth earthquakes genesis within Vrancea zone, 233-248

Besutiu, L., Orlyuk, M., Zlagnean, L., Romenets, A., Atanasiu, L., Makaraenko, I. (2014) *Peceneaga-Camena Fault: Geomagnetic insights into an active tectonic contact*. Geophysical Journal, 1, 36, 133-144, ISSN 0203 – 3100

Besutiu, L., Zlagnean, L. (2009) *Geodynamic considerations on the space-time migration of the Vrancea intermediate-depth seismicity*: in Besutiu, L. (Ed.) Integrated research on the intermediate depth earthquakes genesis within Vrancea zone, 140-152, ISBN 978-973-7600-59-2

Besutiu, L., Zlagnean, L. (2009**) Watching structural and geodynamic features of a plate boundary: Peceneaga-Camena Fault,** Geophysical Research Abstracts, Vol. 11, EGU2009-12023, 2009 EGU General Assembly 2009

Besutiu, L., Zugrăvescu, D. (2004) *Considerations on the Black Sea opening and related geodynamic echoes in its NW inland as inferred from geophysical data interpretation.* Ukrainian Geologist, no.3, p. 51-60, Kiev

Cosma C., Cucoş (Dinu) A., Papp B., Begy R., Gabor A., Bican -Brişan N., Besutiu L. (2014) *Radon implications in life and Earth Science: Baita-Stei and Peceneaga-Camena Fault (Romania).* Carpathian Journal of Earth and Environmental Sciences, 9, 2, 15 - 21, ISSN 1842 - 4090, on line ISSN 1844 - 489X,

Ferrari, L., Orozco-Esquivel, T., Manea, V.C., and Manea, M., 2012. The dynamic history of the Trans-Mexican Volcanic Belt and the Mexico subduction zone, Tectonophysics, 522-523, p. 122-149

Franco, A., Lasserre, C., Lyon-Caen, H., Kostoglodov, V., Molina, E., Guzman-Speziale, M., Monterosso, D., Robles, V., Figueroa, C., Amaya, W., Barrier, E., Chiquin, L., Moran, S., Flores, O., Romero, J., Santiago, J.A., Manea, M., and Manea, V.C. (2012) Fault kinematics in northern Central America and coupling along the subduction interface of the Cocos Plate, from GPS data in Chiapas (Mexico), Guatemala and El Salvador. Geophysical Journal International, 189, 1223-1236.

Ghitau, D. (2003) *Some results obtained from three dimensional plate kinematics analyses in Romania (1997-2000)*, Rep. Geod., 3/66, 91-106, Warsaw

Gurnis, M., Turner, M., Zahirovic, S., DiCaprio, L., Spasojevic, S., Müller, R.D., Boyden, J., Seton, M., Manea, V.C., and Bower, D.J., 2012. Plate tectonic reconstructions with continuously closing plates, Computers and Geosciences, no. 38, pp. 35-42, doi:10.1016/j.cageo.2011.04.014,

Lazarescu, V., Popescu, M.N. (1984) *Correlation paleo-recent tectonics at the Eastern Carpathians arc bend*. Rev. roum. géol., géophys., géogr., ser. Géophys., 28, 3-18

Manea V.C., Manea M., Pomeran M., Besutiu L., Zlagnean L., *A pararrelized particle tracing code for CFD Simulations in Earth sciences*, Acta Universitaria, vol 22 (5),2012, Número de Certificado de Reserva de Derechos 04-2008-100 113 17 1300-102 ISSN 0188-6266

Manea, V.C., Manea, M., Ferrari, L., 2013. A Geodynamical Perspective on the Subduction of Cocos and Rivera plates beneath Mexico and Central America. *Tectonophysics, http://dx.doi.org/10.1016/j.tecto.2012.12.039*

Manea, V.C., Manea, M., Pomeran, M, Besutiu, L., Zlagnean, L., *Computational Fluid Dynamics in Solid Earth Sciences – a HPC challenge.* Acta Universitaria. In publication. ISsN 0188-6266

Manea, V.C., Perez-Gussinye, M., and Manea, M., 2012. *Chilean flat slab subduction controlled by overriding plate thickness and trench rollback*, Geology, v.40, no.1, pp. 35-38; doi: 10.1130/G32543.1,

Tondi R., Achauer U., Landes M., Davi R., Besutiu L. (2009) *Unveiling seismic and density structure beneath the Vrancea seismogenic zone, Romania*, Journal of Geophysical Research, vol.114, B11307, doi:10.1029-2008JBOO5992

IAGA ACTIVITIES IN ROMANIA

2011-2014

IAGA RELATED ACTIVITIES IN ROMANIA
2011-2014

Romanian IAGA Committee

National Correspondents:

Dr. Venera Dobrica[1] venera@geodin.ro
Mr. Andrei Soare[2] andisol9@gmail.com

Members:

Dr. ing. Dumitru Stanica[1] dstanica@geodin.ro
Prof. Cristian Panaiotu[3] cristian.panaiotu@g.unibuc.ro

Secretary:

Dr. Anca Isac[4] anca.isac@igr.ro

1) Institute of Geodynamics, Romanian Academy
19-21 J.L. Calderon st., 020032, Bucharest 37, Romania
Tel: +40213172126; Fax: +40213172120
2) former Geological Institute of Romania
1 Caransebes str., 012271,
Bucharest, Romania
Tel: +40747373179
3) University of Bucharest, Faculty of Physics,
405 Atomistilor, 077125, Magurele, Romania
Tel: + 40740060659
4) Geological Institute of Romania
1 Caransebes st., 012271,
Bucharest, Romania
Tel: +40314033480; Fax: +40314033499

Division I: Internal Magnetic Fields
Working Group WGI.1: Theory of Planetary Magnetic Fields

The last decades of satellite missions dedicated to measuring planetary magnetic fields have in-creased considerably the amount of available data. Among them, magnetic measurements repre-sent one of the most used remote-sensing tools for planetary missions. Due to the highest quality, a better description and understanding of magnetic fields of terrestrial bodies were rapidly improved and new magnetic field maps and models were developed. Based on these achievements, the studies developped in the last four years used all global investigative opportunities trying to prove scientifically that a planetary geological phenomenon (impact cratering) that has shaped the planets of our solar system, 4 billion years ago, can be accurately detected by magnetic measurements.

This axis of this research is based on the use of the newest global accurate magnetic models to characterize impact craters structures. The largest impact craters on the Earth, Mars and Moon are identified, first by their quasi-circular features from the most recent and detailed topographic maps and then, from available global magnetic maps and finding their specific magnetic patterns. The existence of crustal magnetic anomalies on Mars and Moon, and the lack of an internally self-generated magnetic field suggest that physical conditions within these bodies have been changed through the geological time-scale, from an earlier active dynamo, as the Earth still preserves, to a weaker or ceased one. The demagnetization effects due to the impact shock wave and excavation processes are evaluated by means of a forward modeling approach, using the Equivalent Source Dipoles (ESD) method and by reducing the thickness of the pre-magnetized lithosphere due to the impact shock wave and excavation processes. Crater dimensions (tens to thousands kilometers) are considered a unique demonstration of the fact that the maps and global models are capable of detecting magnetic anomalies with local extension, not just regional, to the limit of their resolution. The interest in this topic has been motivated by the The most recent compilations, maps and models of crustal magnetic fields, as well as topographic and crustal thickness maps derived for these three bodies.

The first compilation World Digital Magnetic Anomaly Map (Korhonen et al., 2007) is the most important achievement in describing the Earth's crustal field. For detailed analysis of martian impact craters the electron refection (ER) map of Lillis et al. (2008b), the low-noise internal magnetic field model of Lillis et al. (2010), the internal dipole model of Langlais et al. (2004) and the model of Mars crustal structure (Neumann et al., 2004), at diferent altitudes, were used. Recent global models of the internal magnetic field of the Moon used include those of Purucker (2008) and the newest global internal magnetic field model of Purucker and Nicolas (2010). The position of craters and their rings were first established on the morphologic evidence no other than their topographic shape from the most recent topographic maps: the Shuttle Radar Topography Mission (SRTM) (Farr et al., 2007) for Earth, the MOLA map (Zuber et al., 1992; Smith et al., 2001) for Mars, and the Unified Lunar Control Network(ULCN) 2005 (Archinal et al., 2005), the Kaguya-SELENE map (Araki et al., 2009) and LOLA topography (Chin et al., 2007; Smith et al., 2010) for the Moon. Together with the GRIDVIEW, a NASA's software (Roark et al., 2000; Roark and Frey, 2001) they make it possible for the first time to analyze planetary topographic and magnetic data. The magnetic signature of 28 craters on Earth, 34 craters on Mars and 37 on the Moon were studied. The resulting characteristics were grouped in tables and some characteristics and patterns can be mentioned:

- Impact cratering has shaped the crustal magnetic field of terrestrial planets. It is associated with material excavation, thermal and shock phenomena. They can be often characterized by broad magnetic lows if they were formed in the absence of an active inductive magnetic field. In the presence of an active internal field, the process of (de)magnetization due to the shock impact is associated with post-impact (re)magnetization (mainly thermal) processes, generating a more complex magnetic signature;

- The shock (de)magnetization should be accepted as the prime characteristic of a hypervelocity impact, strongly associated with the mechanics of impact crater formation. The shock pressure area bigger than 1 GPa capable to erase the magnetization, is not restricted to the area of the transient cavity (Scott et al., 1997), but to an area at least double to transient cavity;

- Earth's impact craters with diameters under 100 km (the largest multiring candidates show more complex signatures) present a low magnetic signature at 5 km altitude (such as the Acraman structure). Here, on Earth, the thermoremanent magnetization in an internal global field is associated with shock demagnetization. In such case, the randomly and strong magnetization vectors efectively cancel aut when summed over the whole crater, due to the resulted short-waves anomalies;

- All middle and late Noachian large craters from Mars (< 4 Gy) are completely demagnetized, with no significant magnetic anomalies. They have presumably been demagnetized by the impact event that created each large basin, suggesting a ceased dynamo and no global field at that time. This is the case of late largest Nectarian and Imbrian craters (< 3:85 Gy) from the Moon, too. They are characterized by a magnetic disruption signature. Why and how a dynamo stopped is still waiting to be investigated with the new sets of satellite data;

- The oldest basins from Mars (> 4:2 Gy) or from Moon (> 3:9 Gy) present anomalies with a distribution which might indicate that their sources are genetically associated with the crater-forming events. In these cases, the shock demagnetization of the central uplift is overlapped by the thermoremanent magnetization carried by a higher coercivity component of the impact melt rocks, in a steady magnetizing field of a former dynamo. This is also the case of the three largest multiring craters of the Earth (Vredefort, Sudbury and Chicxulub), that show the same complex magnetic signature;

- The spatial resolution of used magnetic maps and models of the same order as the orbital altitude, only allowed the study of the largest impacts. Craters smaller than 400 km for Mars, 70 km for Moon and 30 km for the Earth could not be included on these studies;

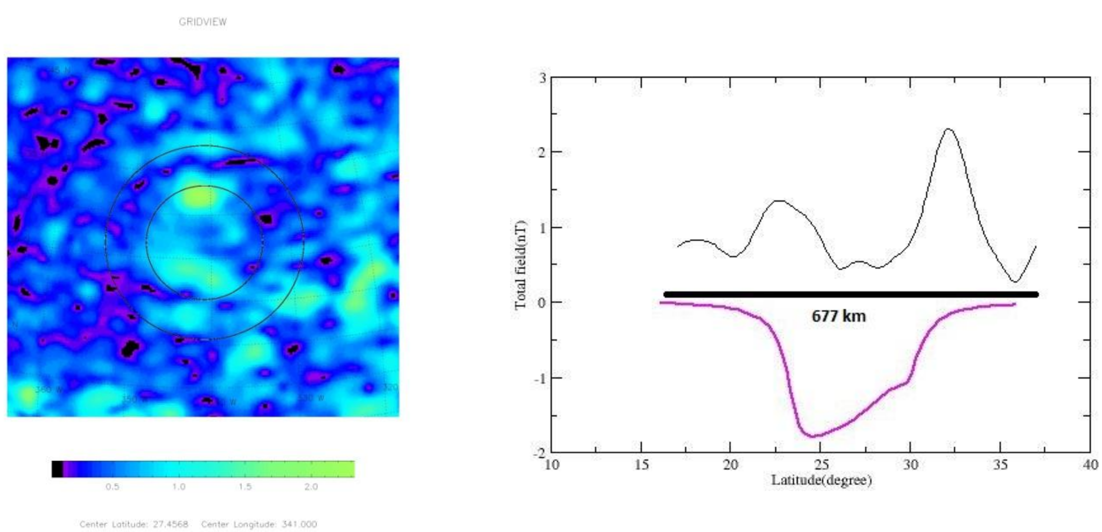


Figure 1. Magnetic map from LP observations (left), 64 km wavelength resolution , by Purucker and Nicholas, 2010 and comparison on a N-S profile (right) between crustal field magnitude (black curve) and ESD predicted signal (magenta curve), at 30 km altitude, over Serenitatis, 677 km diameter crater, centered at 27_N. The scalar field of the predicted signal with opposite sign, as a deficit, is considered with respect to 0 baseline.

- The modeling method (ESD) could reveal that in all cases, regardless of the planet, crater size or age, the impact afected the magnetic properties of rocks, primarily due to the shock, disturbing and diminishing previous magnetization. ESD modeling results are especially consistent with the largest and young craters from Mars and Moon (< 4 Gy) and with smaller craters (< 100 km) from Earth (see Figure 1);

- 4 Gy is proposed to account for the cessation of martian and lunar dynamos, as a result of a rapid inner core development against a thiner and thiner outer core incapable to longer sustain an active dynamo by means of convection currents. Additionally, largest impacts from Mars and Moon have demagnetized the upper 40 km of the late Noachian and Nectarian crust (the better results were obtained using a rate depth to diameter of 1/10. The modeling method is able to demonstrate that largest impacts have afected the entire crust of the planets, especially during the Late Heavy Bombardment, about 4 to 3:8 Gy ago. On Earth, this event was lost due to its constantly renewed surface.

Published papers

Isac, A., Mandea, M., Purucker, M., Langlais, B., 2015, A comparative analysis of the magnetic characteristics of impact craters on terrestrial planets and Earth's Moon, Advances in Space Research (submitted);

Isac, A., 2013, Exploring the magnetism of impact craters on Earth, Mars and Moon, *PhD Thesis*, Romanian Academy, Institute of Geodynamics *Sabba S. Stefanescu*, Dr. C. Demetrescu and Prof. Dr. M. Mandea supervisors;

Conferences

Isac, A., Mandea, M., Purucker, M., 2010. Impact structures seen by magnetic anomaly maps. European Geoscience Union General Assembly, Vienna 12, EGU2010_7852;

Isac, A., Purucker, M., Mandea, M., Frey, H., 2011. Magnetic characteristics of the largest impacts on the Moon, Mars, and Earth. European Geoscience Union General Assembly, Vienna 13, EGU2011_7455;

Isac, A., Langlais, B., Mandea, M., 2012. Demagnetization patterns seen in global magnetic models of Earth, Mars and Moon. Geophysical Research Abstracts, ISSN:1029-7006 14, EGU2012_7311;

Isac, A., Mandea, M., Purucker, M., 2013. Reading the Magnetic Patterns in Earth complex impact craters to detect similarities and clues from some Nectarian craters of the Moon. Geophysical Research Abstracts, ISSN:1607-7962 15, EGU2013_9649;

Isac A., Mandea, M., Purucker, M., 2014, Magnetic patterns of impact craters, EGU General Assembly 2014, Vienna, Geophysical research Abstracts, Vol. 16, EGU2014-3306;

Mandea, M., Isac A., Purucker M., 2014, Magnetic insights of the Earth, Mars and Moon's large impact craters, The 40th COSPAR Scientific Assembly, Moscow, Russia;

Acknowledgements. This report was prepared by Dr. Anca Isac

Working Group WGI.2: Electromagnetic Induction in the Earth

In the interval 2011–2015 the electromagnetic researches involved in the frame of the IAGA and Inter-Associations (IAGA-IASPEI-IAVCEI) working group on “Electromagnetic Studies of Earthquakes and Volcanoes “(EMSEV) have included the following activities:

1. Magnetotelluric studies for a better knowledge of the deep geoelectric structure on the Romanian territory, concerning especially the Vrancea geodynamic active area. This activity was carried out in the frame of the NP II research project IDEI, entitled “The geomagnetic field under the heliospheric forcing. Inferring Earth internal structure and evaluating geophysical hazard of solar eruptive phenomena”. In this respect it was elaborate the 2-D resistivity models on the following geotransects (Fig.1):

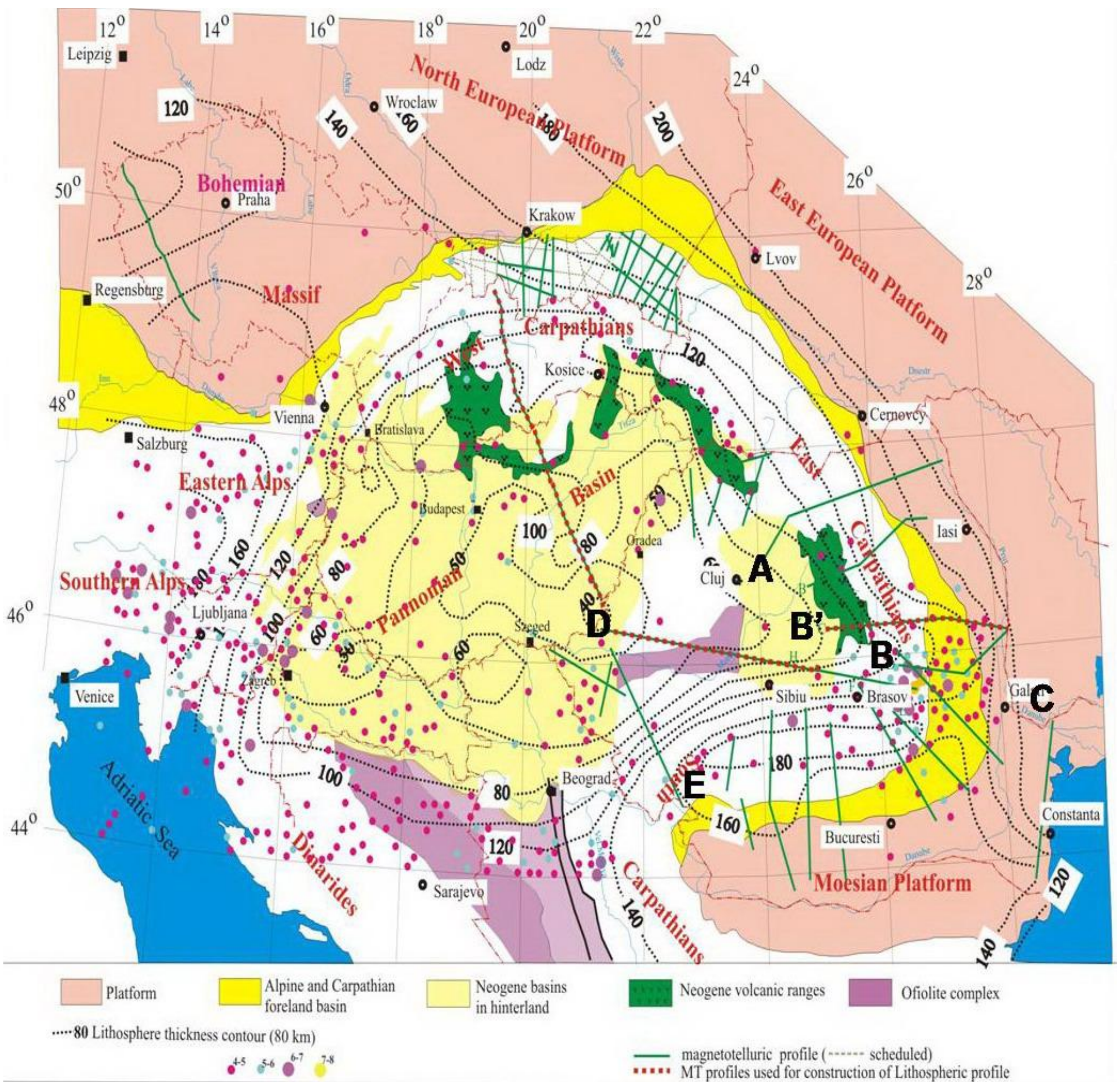


Fig. 1. Map with magnetotelluric geotransects on the Romanian territory

- ***Bistriţa-Vatra Dornei- Suceava (A) ;***
- ***Ulcani – Sâncraieni - Slobozia – Tătăraşi (B’);***

- ***Tg. Secuiesc – Tulnici - Fălciu (B)***
- ***Baia – Enisala – Agighiol - Sf. Gheorghe (C);***
- ***Vărşand-Alba Iulia-Agnita-Hoghiz (D);***
- ***Vărşand-Lipova-Lugoj-Teregova (E);***

2. Assessment of the electromagnetic (EM) precursory parameters related to intermediate-depth earthquakes characteristic of the seismic-active Vrancea zone and the seismic-induced landslides obtained in the frame of the Priority Program of the Romanian Academy, "Complex geophysical research in geodynamic active areas, with a special emphasis on the Vrancea seismogenic area".

The EM and geomagnetic time series obtained at the Geodynamic Observatory Provita de Sus by using a specific ground-base monitoring system (Fig.2) are transferred in near-real time at the Institute of Geodynamics of the Romanian Academy for processing, diagnose and decision.

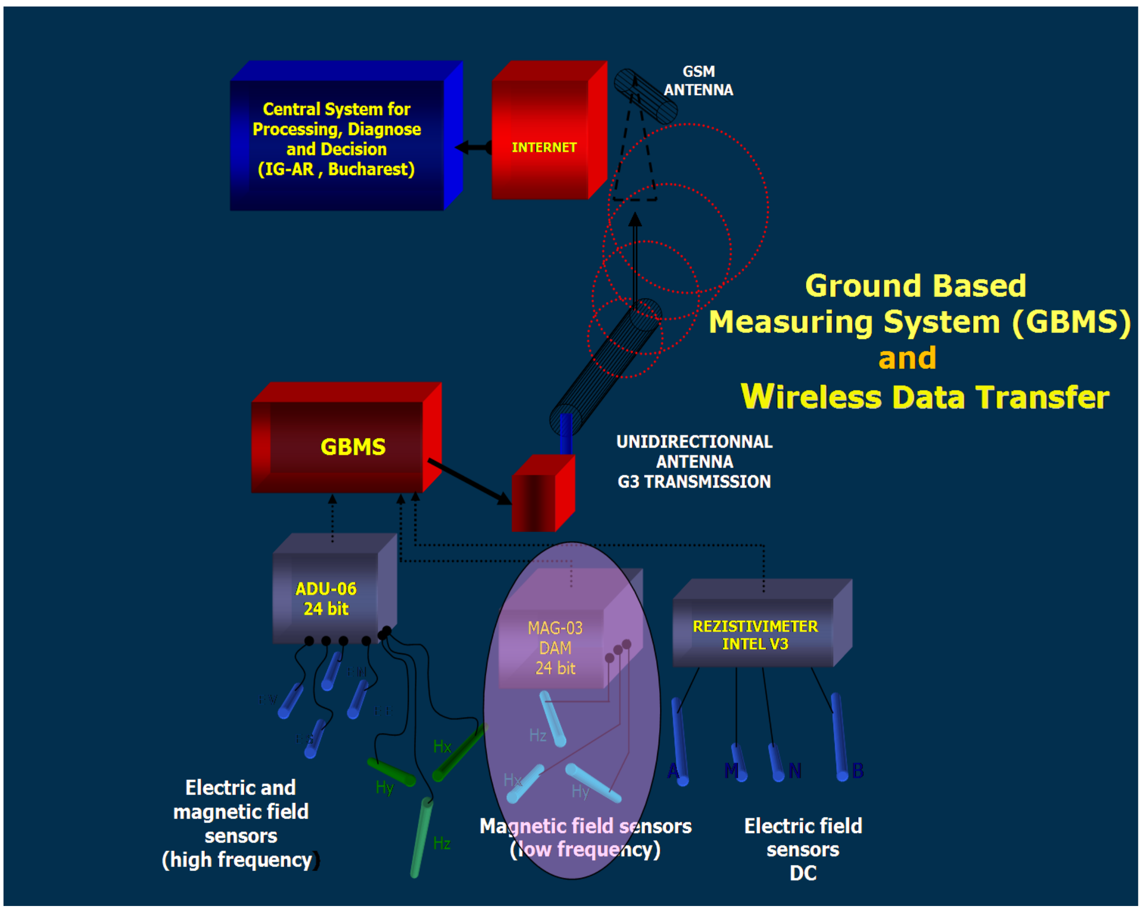


Fig.2. Ground based monitoring system (EM, geomagnetic and DC-Resistivity) and wireless data transfer

The daily mean distribution of the geomagnetic parameters Bzn* is used to emphasize its pre-seismic anomalous behaviour related to the Vrancea intermediate depth earthquakes. With some days before the Eq occurrence this parameter has a significant increasing as a result of the electrical conductivity changes that may be associated with both dehydration-induced rupture processes and fluid flow through the high conductive paths (faults system) developed inside the seismogenic volume and its surrounding area (Fig.3).

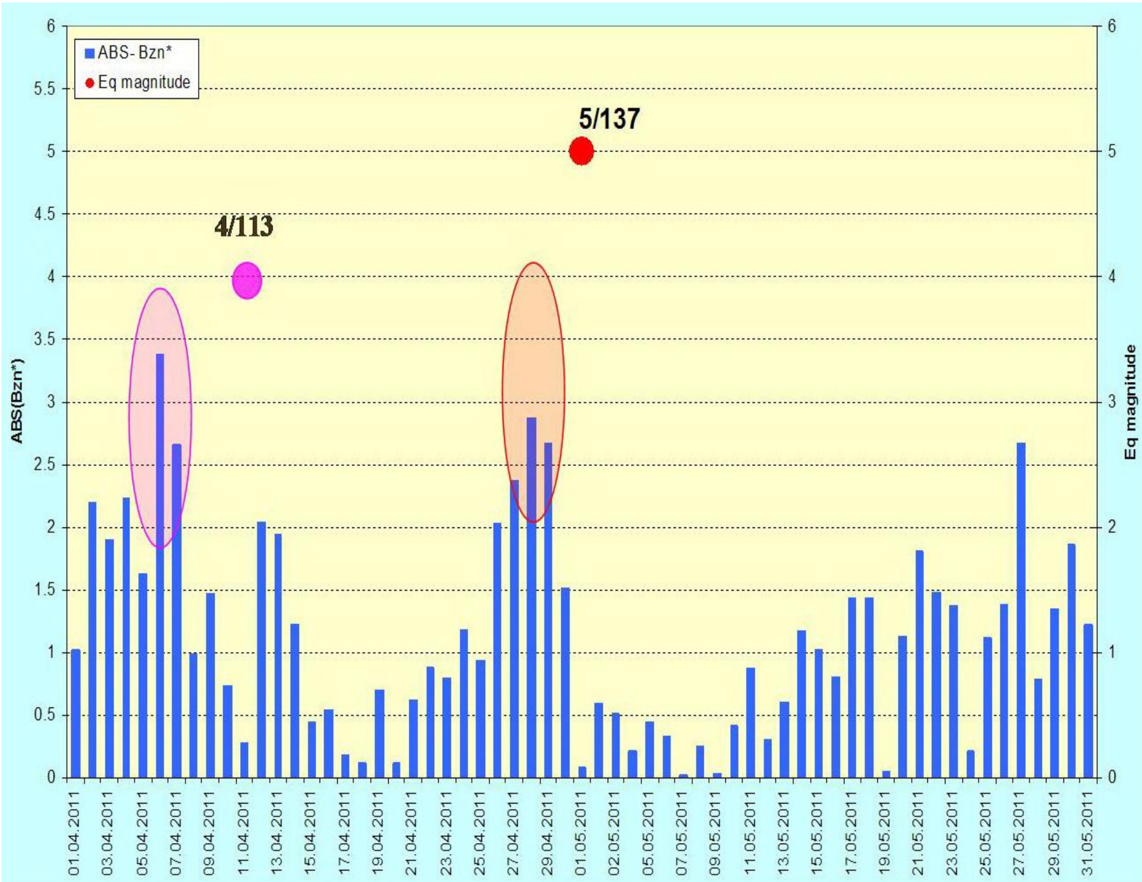


Fig.3. Pre-seismic anomalous behaviour of Bzn* (marked by ellipses) related to the two earthquakes M4 and M5 occurred on the interval April- May 2011

As regards the landslide activity, the following activities have been accomplished: (i) optimization of the specific sensors structure in laboratory and field conditions; (ii) experiment and continuous improvement of the specific ground-base monitoring system at the peculiar conditions of the Provita de Sus -test site for pattern recognition; (iii) getting of the specific data to produce two-dimensional tomographic images as a first step for the risk assessment; (iv) assessment of the electromagnetic parameters related to both the earthquakes characteristic to the seismic-active Vrancea zone and the landslides associated to the active fault.

The final results highlight the possibility of merging electromagnetic parameters with tomographic images and with low frequency electric signals occurred prior the stress to reach a critical value. Subsequently, in the Provita de Sus test site, after implementing this complex monitoring system, it was possible to provide early-warning against the risk arising from landslide triggered by the Vrancea earthquakes.

Published papers

D. Stanica and D. A. Stanica, Anomalous pre-seismic behavior of the electromagnetic normalized functions related to the intermediate depth earthquakes occurred in Vrancea zone, Romania, EGU, Nat. Hazards Earth Syst. Sci., 11,3151-3156, 2011, doi:10.5194/nhess-11-3151-2011.

Dragos Armand Stanica and Dumitru Stanica, High frequency electromagnetic and DC resisitivity monitoring system for near real-time earthquake-induced landslides assessment, Global Mtg. Abs.15, 26 (2011); http://dx.doi.org/10.1190/1.3659067.

Dragos Armand Stanica and Dumitru Stanica, Correlation between the Vrancea seismicity and anomalous behaviour of some electromagnetic parameters, Rev. Roum. GEOPHYSIQUE/Romanian Geophys. J., 55,69-76, 2011.

Dumitru Stanica and Dragos Armand Stanica, *Earthquakes precursors*, in "Earthquake Research and Analysis-Statistical Studies, Observations and Planning" Book 5, edited by: Sebastiano D'Amico, ISBN 978-953-51-0134-5, InTech open access publisher, Chapter 4, 79-100, 2012, doi:10.5772/2461.

Dragos Armand Stanica, Contributions regarding the seismic hazard assessment in Vrancea zone and the associated phenomena (landslides) by electromagnetic studies, Abstract of the PhD Thesis, 2014, www.geodin.ro

Dragos Armand Stanica, Dumitru Stanica, Short-term EM precursors related to Vrancea M ≥ 5 earthquakes, Extended abstract, Abstracts Book, EMSEV Warsaw 2014, 41-44, 2014.

Dragos Armand Stanica, Dumitru Stanica, Nicoleta Vladimirescu, Long-range anomalous electromagnetic effect related to M9 Great Tohoku earthquake, Earth Sciences, Vol. 4, No. 1, 2015, pp. 31-38, doi: 10.11648/j.earth.20150401.13

Conferences

Dumitru Stanica and Dragos Armand Stanica, Electromagnetic methodology used to assess the short-term precursory parameter related to seismic activity, EGU, Geophysical Research Abstracts, Volume 13, April, Vienna, Austria, 2011, ISSN: 1029-7006.

Dumitru Stanica and Dragos Armand Stanica, Electromagnetic pre-seismic anomalies induced by intermediate depth earthquakes (Vrancea zone-Romania), Abstracts Volume at Japan Geophysical Union Meeting, May 2011, Chiba, Japan.

Dragos Armand Stanica Earthquakes induced landslides reflected by dc resistivity and high frequency electromagnetic data, Abstracts Volume at Japan Geophysical Union Meeting, May 2011, Chiba, Japan.

Dumitru Stanica and Dragos Armand Stanica, Low frequency anomalous pre-seismic behavior of the electromagnetic normalized functions related to the sub-crustal earthquakes (Vrancea-Romania), EGU, Geophysical Research Abstracts Vol.14, EGU2012,ISSN: 1029-7006.

Dragos Armand Stanica, Electromagnetic ground-based measuring system used for the near real-time hazard level assessment of the earthquake-induced landslides, EGU, Geophysical Research Abstracts Vol.14, EGU2012, ISSN: 1029-7006.

Dumitru Stanica and Dragos Armand Stanica, Pre-seismic ULF Geomagnetic Signature Related to the M9 Great Tohoku Earthquake on March 11, 2011, Abstract at AOGS-AGU (WPGM) Joint Assembly, August 2012.

Dumitru Stanica and Dragos Stanica, Possible correlations between the pre-seismic anomalous behaviour of the electromagnetic parameters and the extreme seismic events; Case study: M9 Great Tohoku earthquake on March 11, 2011, EGU, Geophysical Research Abstracts Vol.15, EGU2013, ISSN: 1029-7006.

Dumitru Stanica and Dragos Stanica, EM imaging along the intra-plate collision suture zone and its geodynamic and seismic implication, Abstract at 12th Scientific Assembly of IAGA, Merida-Yucatan, Mexico, August 26-31, 20013.

Dumitru Stanica and Dragos Stanica, EM studies for the earthquake-induced landslides hazard assessment, Abstract at 12th Scientific Assembly of IAGA, Merida-Yucatan, Mexico, August 26-31, 20013.

Dumitru Stanica and Maria Stanica, Carpathian Electrical Conductivity Anomaly and its geodynamic implication reflected by 2-D magnetotelluric modeling, NEMO – Workshop, Bucharest, June 10-11, 2013.

Dumitru Stanica, Dragos Armand Stanica and Nicoleta Vladimirescu, M9 Great Tohoku earthquake and its global pre-seismic geomagnetic effect, Annual Scientific Session of the Institute of Geodynamics, January 9-10, 2014.

Dumitru Stanica and Dragos Armand Stanica, Possible correlation between the pre-seismic anomalous behaviour of the normalized function Bzn and the intermediate-depth earthquakes, Vrancea zone. Annual scientific session of the Institute of Geodynamics, January 9-10, 2014.

Marian Popescu, Analysis of geomagnetic signal associated with seismic events, Annual scientific session of the Institute of Geodynamics, January 9-10, 2014.

Dumitru STANICA and Armand Dragos STANICA, Pre-seismic electromagnetic anomalies induced by intermediate-depth earthquakes (Vrancea zone-Romania), EGU, Geophysical Research Abstracts Vol.16, EGU2014, ISSN: 1029-7006, 2014.

Dragos Armand Stanica, Dumitru Stanica and Nicoleta Vladimirescu, Long range pre-seismic geomagnetic effect related to M9 great Tohoku earthquake on 11 march 2011, EGU, Geophysical Research Abstracts Vol.16, EGU2014, ISSN: 1029-7006, 2014.

Acknowledgements. This report was prepared by Dr. Dumitru Stanica and Dr. Dragos Armand Stanica.

Working Group I.3: Palaeomagnetism
Working Group I.4: Rock- and Environmental Magnetism

PALAEOMAGNETIC, ROCK MAGNETIC AND ENVIROMAGNETIC STUDIES, IN THE GEOLOGICAL INSTITUTE OF ROMANIA, IN THE 2011 – 2015 PERIOD

Dr. Sorin – Corneliu Rădan, Geophysicist

1. Introduction

Since 2011, the research activity in the *Laboratory of Magnetism of Rocks and Sediments* from the *Geological Institute of Romania* (*G.I.R.*) has focused on both ***Palaeomagnetism***, and ***Rock- and Environmental Magnetism*** (according to the **IAGA Working Groups I.3** and **I.4**, respectively). Therefore, new data have been added to those mentioned in the previous "Report of the Romanian IAGA Section", particularly relating to the **WG I.3** and **WG I.4** (**References – Ch. I.3**)*. Our studies concerning the investigation of the state of the "*magnetic recording medium"* (*m.r.m.*)– of essential importance in order to decipher correctly the Earth's magnetic field structure in the geological past – have continued. Based on a huge magnetic susceptibility data bank covering around 40 years of research on recent sediments, new cases from the most important wetlands in the (southeastern) Romania were approached. Moreover, several papers concerning magnetostratigraphic, petromagnetic, magnetic or enviromagnetic results obtained in/by our laboratory were mentioned and/or analysed by other either Romanian or foreign authors, in publications issued in the 2011 – 2015 period, or were introduced in *International Databases* and/or in *Libraries of Universities* from abroad (**References**: **Ch**. **III**).

All these aspects regarding the research activity in the above-mentioned fields in the *G.I.R.* are supported by comprehensive references: publications (chapters in books and field guidebooks; abstracts, extended abstracts, papers; **References**: **Ch**. **I.1, Ch. I.2**), and oral/poster presentations at different international scientific assemblies (symposia, conferences/meetings inside of International Projects/workshops; **References**: **Ch**. **II**), which are listed at the end of this brief review.

Firstly (**Ch. 2**), in this Report, are presented data provided by the *Palaeomagnetic* activities, *i.e.* which are connected with the **WG I.3**, and secondly (**Ch. 3**), are mentioned *Rock*- and *Enviromagnetic* results, which, according to the new structure, are enclosed, together, within the **WG I.4**.

---

* *Note*: *e.g.*, **References**: **Ch.I.3** will be further expressed, shortly, as **R.-I.3**.

2. Palaeomagnetism (WG I.3)

Related to the 2011 – 2015 period, the *palaeomagnetic* data achieved in the *Geological Institute of Romania* have concerned the sedimentary formations only, but the investigated deposits are characterized by different lithological and genetical characteristics. Moreover, their ages are placed at the ends of a long time interval, *i.e. Cretaceous – Quaternary*.

❑ Thus, the oldest studied deposits refer to the ***bauxitic formation*** (*Pădurea Craiului Mountains*, northwestern *Apuseni Mountains*), which is sandwiched between marine limestones of latest *Jurassic* age below, and *mid-Early Cretaceous* above (Grigorescu, 1993, in Benton *et al*., 1997). A short review of the main *rock-magnetic* (see **Ch. 3** of this Report) and *palaeomagnetic* results was carried out (Rădan, S.C., 2014a: **R.-I.2**). A palaeotectonic message was deciphered from this rock type, among the Cretaceous bauxites investigated in the Pădurea Craiului Mountains being the "*Lens with Dinosaurs*" ("*Bauxite of Cornet*"; http://en.wikipedia.org/wiki/Bauxite_of_Cornet; see also Benton *et al*., 1997).

❑ Passing to the other end of the above-mentioned time interval, an important attention was directed towards the *Quaternary cyclic loess - palaeosoil sequences* in the Romanian Plain and Dobrogea (Rădan, S.C., 2012, 2013, 2014b,c: **R.-I.2**; Rădan, S.C., 2013, 2014: **R.-II**) (Fig. 1). A tentative synopsis (Rădan, S.C., 2012: **R.-I.2**) is mainly focused on the aspects of their dating. It is remarked the way passed through time in order to know the loess age, *i.e.* from the classic stratigraphy/pedostratigraphy to magnetostratigraphy, astronomically tuned ciclostratigraphy, magnetoclimatology, and up to the multi-proxy approach and optical/luminescence dating. In most of the sections, ages up to 781 ka are determined (the loess - palaeosoil horizons are assigned to the *Brunhes Chron* of the ATNTS2004/ATNTS2012), but the synopsis includes a section from Dobrogea (analysed by the Infrared Stimulated Luminescence/*IRSL* dating method; Bălescu *et al*., 2003), wherefore the "estimated geological age" of 800 ka and the *Marine Isotope Stage 20* are mentioned.

Informative palaeomagnetic data, relating to some loess and palaeosoil deposits from Dobrogea, are presented in a *Field Trip Guidebook* (Rădan, S. *et al*., 2013b: **R.-I.1**), published for the 2013 Meeting of "International Quaternary Association" (*INQUA*) – "Section on European Quaternary Stratigraphy" (*SEQS*), held in Romania (23rd - 27th September, 2013).

❍ With regard to the "**Dobrogea**" area, some profiles/diagrams are further given for three significant sections: *Costineşti* (Fig. 2), *Nazarcea* (Fig. 3) and *Cernavodă* (Fig. 4) (location, in Fig. 1; ***Cs***, ***Nz***, and ***Cv***, respectively).

In the *South Dobrogea*, another two loess - palaeosoil sequences were investigated, namely "***Mircea Vodă***" and "***Cuza Vodă***" (**MV** and **CV**, respectively; location, in Fig. 1). Similar palaeomagnetic models were presented at two conferences (Rădan, S.C., 2013, 2014: **R.-II**). The "Mircea Vodă" Section is in the last time in attention of many researchers, various methods of investigation being applied (magnetic susceptibility stratigraphy and magnetostratigraphy included). Moreover, this section was in attention of the INQUA - SEQS field trip carried out in Romania (Rădan, S. *et al*., 2013b: **R.-I.1**).

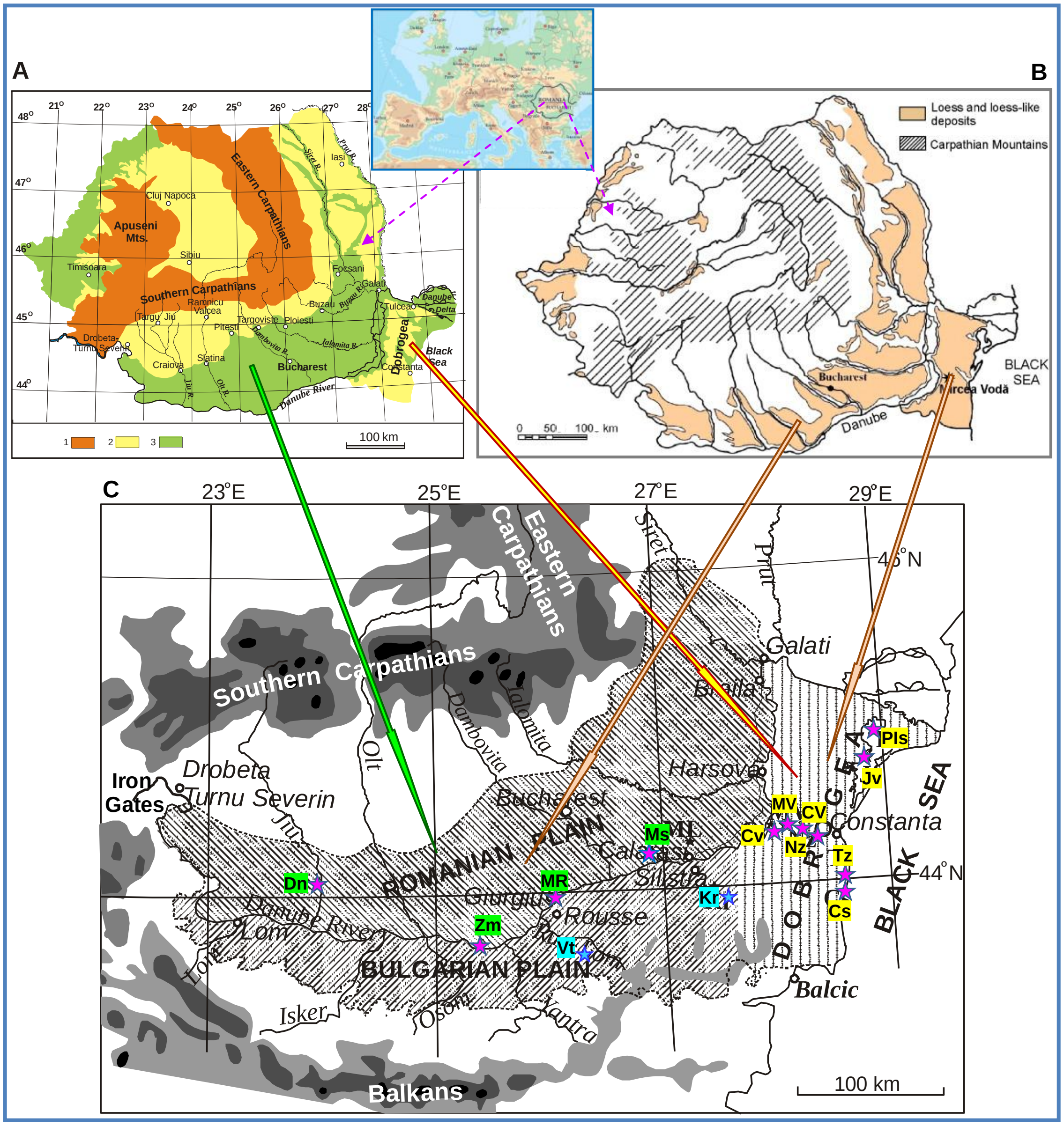


Fig. 1 Location of the most important loess - palaeosoil sections in the Romanian Plain and Dobrogea (Romania), which were investigated for dating by different authors through time. **A**. Simplified physical map of Romania. 1 – Highland relief; 2 – Hilly relief; 3 – Lowland relief (after Jipa & Olariu, 2009). **B**. Map showing the distribution of loess and loess-like deposits in Romania (reproduced from Timar-Gabor *et al.*, 2011). **A-B** *insertion*: Romania location within Europe (http://www.romaniatourism.com/romania-maps/europe-map.html); **C**. The Lower Danube Plain and its main areal subdivisions. The northern limit of the Romanian Plain, after Conea (1970). The southern Bulgarian Plain boundary, from Fotakieva & Minkov (1966). Location of dating loess sections. a) *Romanian Plain*: **Dn** – Drănic; **Zm** – Zimnicea (borehole); **MR** – Malu Roşu; **Ms** – Mostiştea; b) *Dobrogea*: **Ur** – Urluia; **Cv** – Cernavodă; **MV** – Mircea Vodă; **CV** – Cuza Vodă; **Nz** – Nazarcea; **PIs** – Popina Isle (Razelm Lake); **Jv** – Jurilovca (Goloviţa Lake); **Tz** – Tuzla; **Cs** – Costineşti (**C** – after Jipa, 2014, with modifications and additions of some loess section locations). Location of two more sections (referred to in the text), situated in the Bulgarian Plain (Bulgaria), are added: **Vt** – Viatovo; **Kr** – Koriten (after Jordanova *et al.*, 2007) (from Rădan, S.C., 2012: **R.-I.2**; above citations/references included).

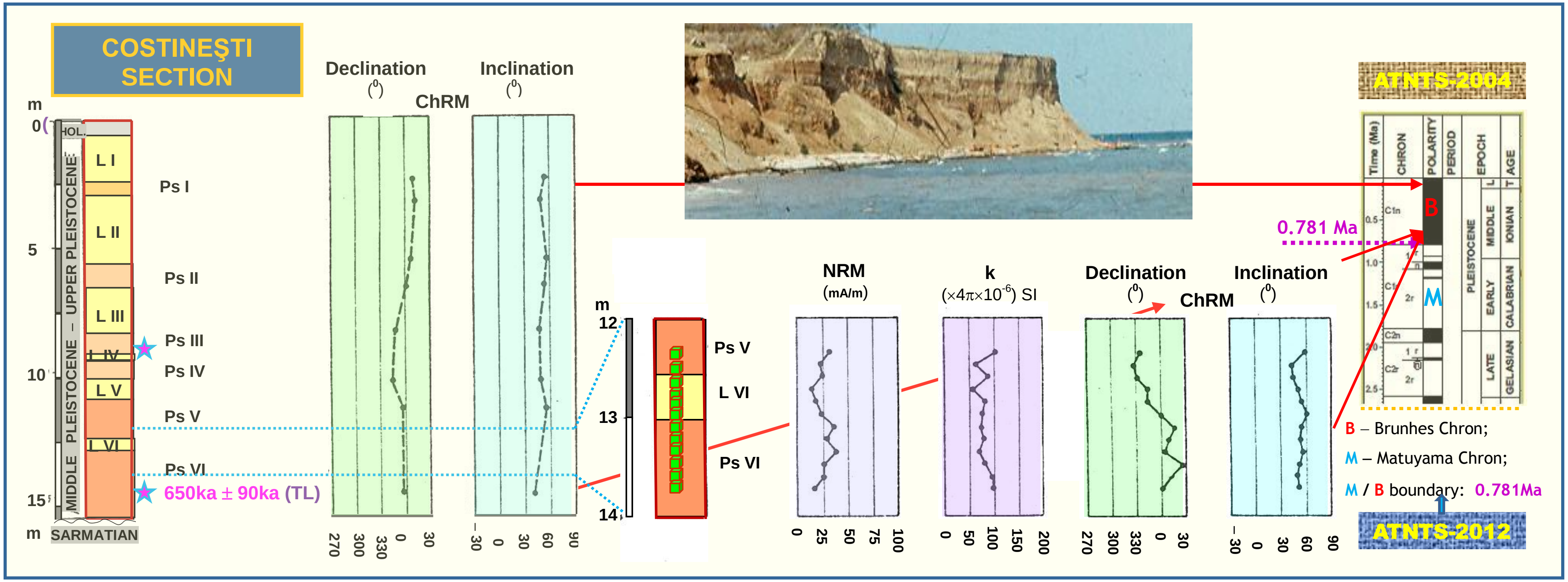


Fig. 2. (Palaeo)magnetic parameters characterising the loess - palaeosoil sequence investigated at Costineşti (Dobrogea, Black Sea coast; see location in Fig. 1). Data after Rădan *et al*. (1984, 1990), Ghenea & Rădan (1993), with modifications and addings. *Legend*: loess; palaeosoil (Chernozem type); Brown - reddish palaeosoil; - Reddish palaeosoil, rich in clay; Thermoluminescence dating [Lublin, Poland – Dr. E. Krol, pers. com.; sampling during the international KAPG field trip, in 1984 (Rădan *et al*., 1984)]. Sampling level [detail in the lower part of the Costineşti section; sampling (in 1983), together with dr. Alois Koči, from the Geophysical Institute of the Academy, Prague]; **NRM** – Natural Remanent Magnetisation; **k** – initial Magnetic Susceptibility (**NRM** intensity and **k**, before thermal cleaning); **ChRM** – Characteristic Remanent Magnetisation (primary magnetisation, isolated by using the stepwise thermal demagnetisation); ATNTS – Astronomically Tuning Neogene Time Scale (a fragment) (from Rădan, S.C., 2013, in Rădan, S. *et al*., 2013b – **R.- I.1**) (Figure included in the Poster given in Fig. 9).

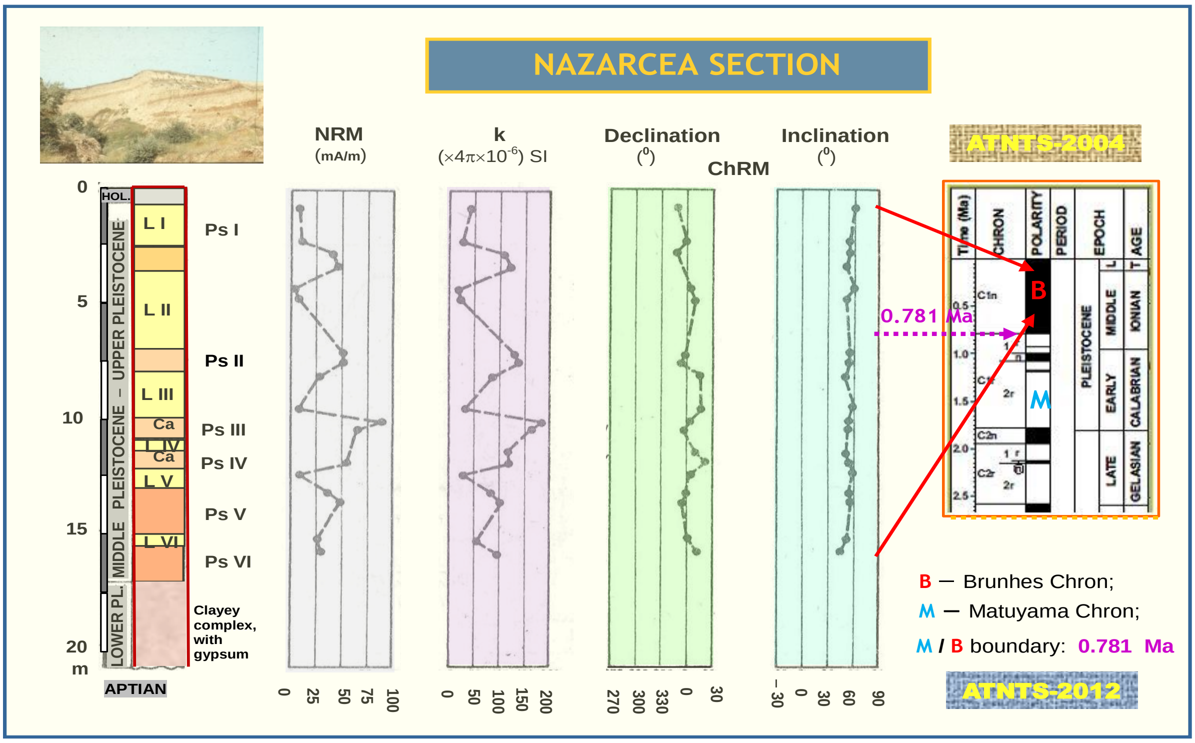


Fig. 3 (Palaeo)magnetic parameters characterising the loess - palaeosoil sequence investigated at Nazarcea (Dobrogea, Poarta Albă – Năvodari Canal zone; see location in Fig. 1). Data after Rădan & Rădan (1984b), Rădan *et al*. (1984, 1990), Ghenea & Rădan (1993), with some modifications/addings. *Legend*: the same as in Fig. 2. (from Rădan, S.C., 2013, in Rădan, S. *et al*., 2013b – **R.-I.1**) (Figure included in the Poster given in Fig. 9).

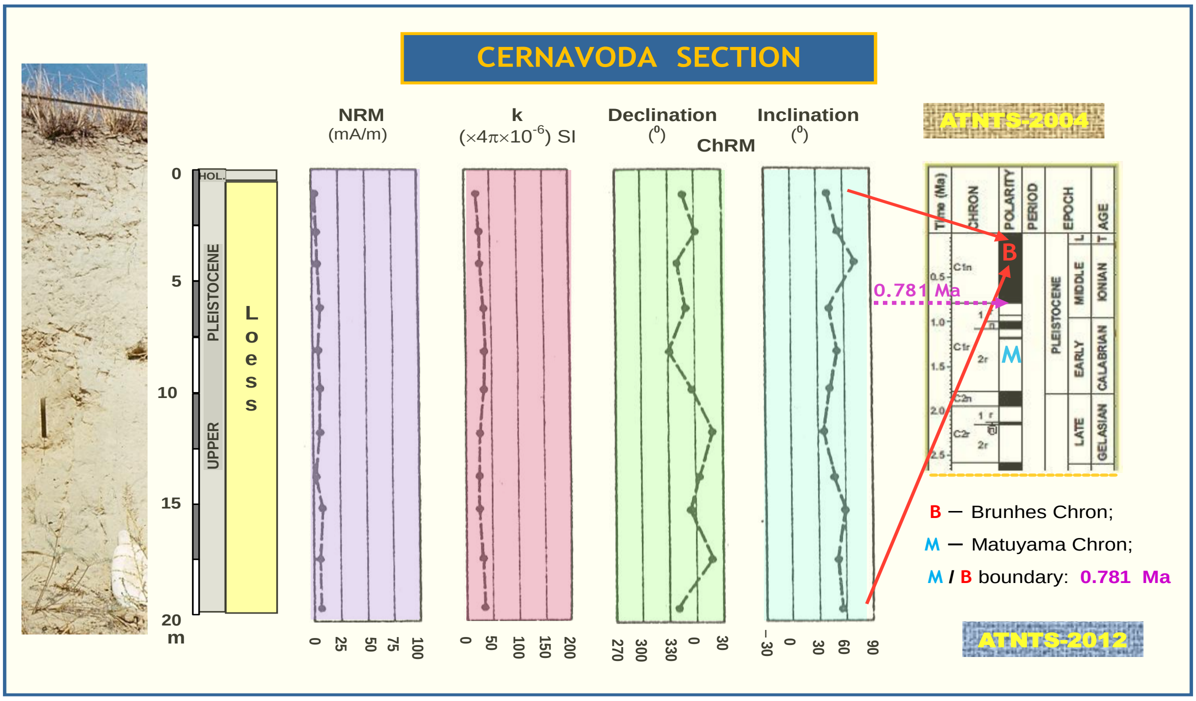


Fig. 4 (Palaeo)magnetic parameters characterising the loess sequence investigated at Cernavodă (Dobrogea, Bogdaproste Hill). Data after Rădan *et al*. (1984, 1990), with some modifications and addings. *Legend*: the same as in Fig. 1. *Photo*: The upper part of the Cernavodă Section (the loess sequence from the photo is not at the same scale with the lithological column from the palaeomagnetic model (from Rădan, S.C., 2013, in Rădan, S. *et al*., 2013b: **R.- I.1**) (Figure included in the Poster given in Fig. 9).

.

.

❍ As regards the second area where we investigated loess or loess - palaeosoil sequences, *i.e. Romanian Plain*, we present here some informative palaeomagnetic data for two sections: "**Drănic**" Section (**Dn**; location, in Fig. 1), situated in its western extremity, and the "**Zimnicea**" profile, placed in the southern extremity (**Zm**, in Fig. 1). Short comments regarding their magnetostratigraphic approach are further referred.

• The palaeomagnetic (also rock-magnetic) investigation of the loess deposits situated in the top part of the composite section "**Drănic**" (Fig. 5) was carried out within a magnetostratigraphic approach of the Pliocene (Romanian) formations which very well crop out in the Jiu - Desnăţui area.

The magnetostratigraphic position of the "**Drănic**" section, particularly of the loess deposits from the top, integrated within the composite model with the correlation of the Upper Pliocene coal bearing formations from several sections in the western Dacic Basin, is illustrated in the synoptic model from Fig. 6. The correlation was carried out at the level of the *Cochiti Subchron* (*Gilbert Chron*; GPTS-CK95 / ATNTS-2004). Related to the "**Drănic**" composite Section, the *Cochiti Subchron* was detected in the basal part of the "*Drănic III*" *sub-section*, while in the top of the "*Drănic I*" sub-section, the *Brunhes Chron* was identified within the loess deposits (see also Fig. 5).

• The updated palaeomagnetic results related to the loess - palaeosoil sequence intercepted in the "**Zimnicea**" borehole profile (**Zm**; location in Fig. 1) were published within the time period under attention in the present IAGA Report (Rădan, S.C., 2012: **R.-I.2**; Rădan, S.C., in Rădan, S. *et al.*, 2013b: **R.-I.1**).

The model with the magnetic susceptibility variations with depth recorded along the *borehole F3-Zimnicea* (up to m39), and with the vertical distribution of the **ChRM** inclinations determined for the m25.1 - m29.7 depth interval is illustrated in Fig. 7.

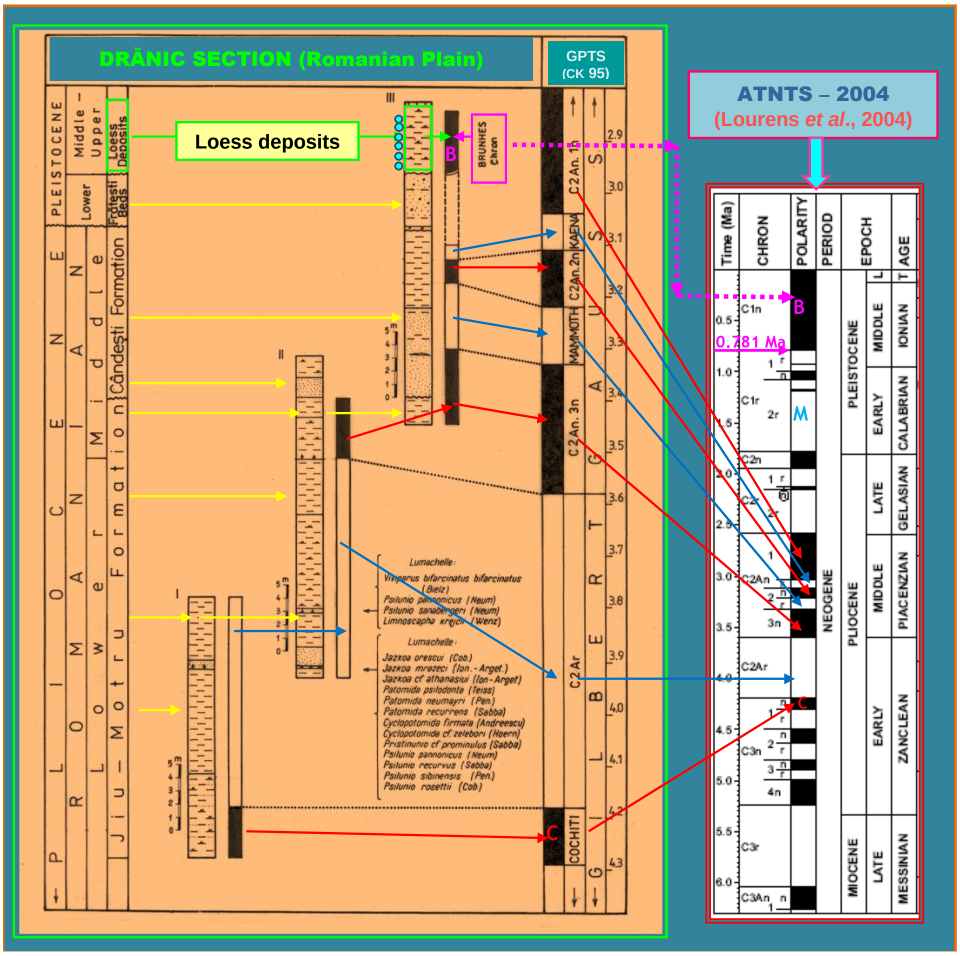


Fig. 5. Magnetostratigraphic model related to the "Drănic Section" (western Romanian Plain), based on the palaeogeomagnetic polarity sequences identified within the *magnetic recording medium* constituted by Romanian and Pleistocene formations (Rădan, S.C., in Rădan, S. *et al.*, 2013b: **R.-I.1**). *Note*: The position of the loess deposits (of Middle – Upper Pleiscoene age) is distinctly marked in the top part of the "subsection III". *Legend*: ○ Sampling point within the Loess Formation. **B** – Brunhes Chron; **M** – Matuyama Chron (in ATNTS-2004). **M** / **B** boundary: 0.781 Ma (according to ATNTS-2004, as well as to ATNTS-2012 of Hilgen *et al.*, 2012); **C** – Cochiti Subchron (4.300 – 4.187 Ma; ATNTS-2004) (from Rădan, S.C., 2013, in Rădan, S. *et al.*, 2013b: **R.-I.1**) (Figure included in the Poster given in Fig. 9).

.

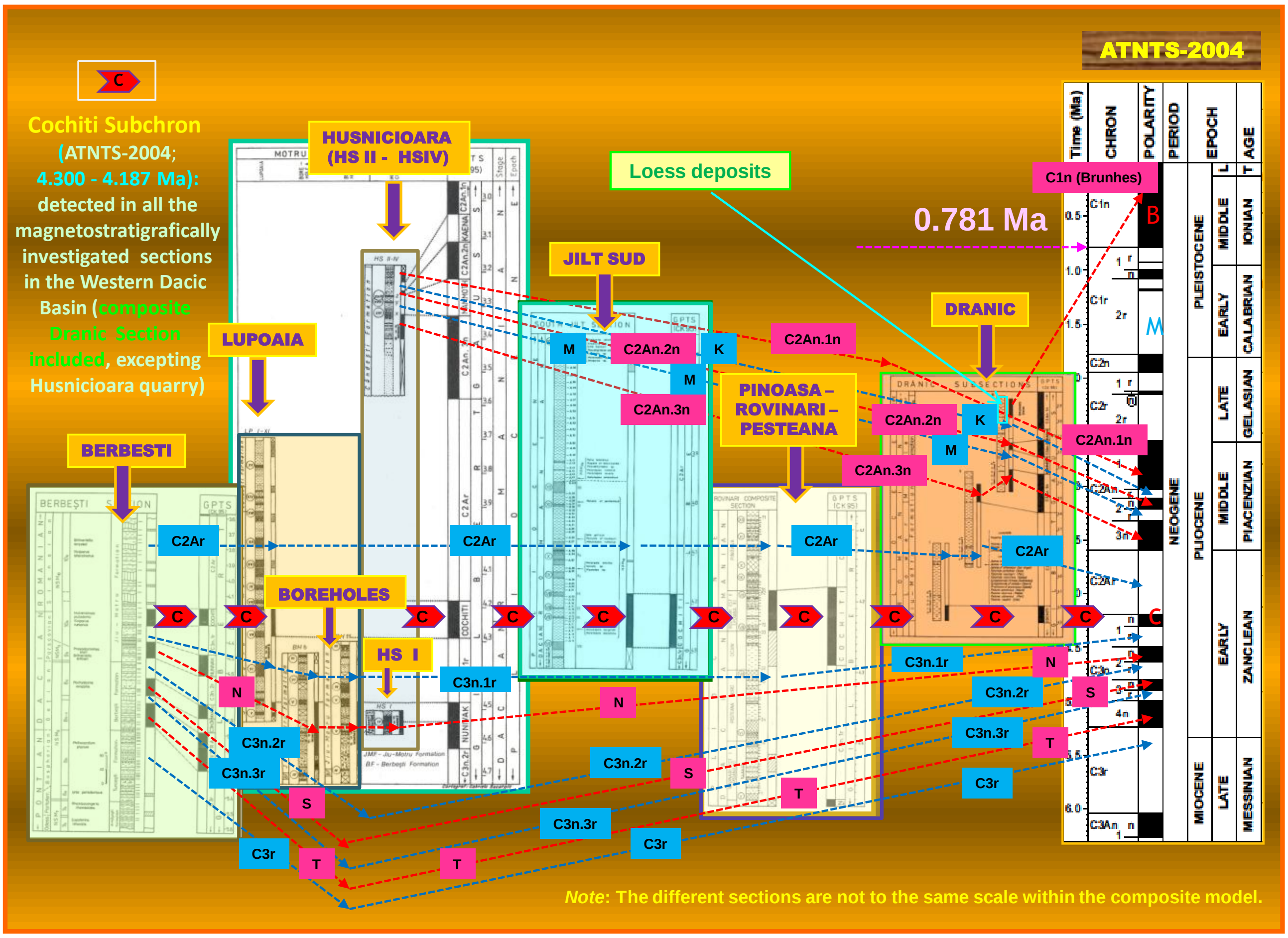
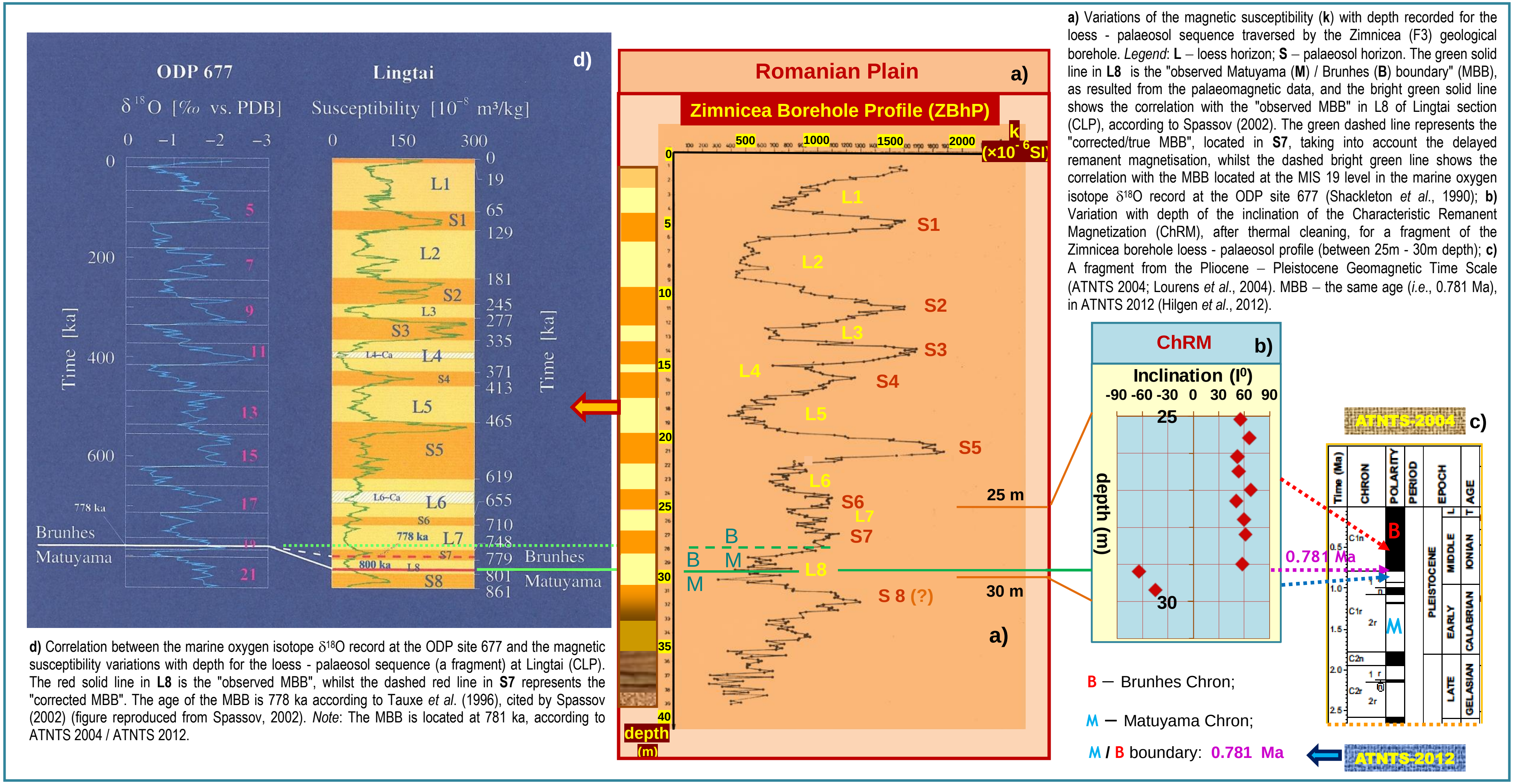


Fig. 6. Synoptic model illustrating the magnetostratigraphic position of the "Drănic section" (particularly the *Loess Formation* from the top), integrated within the composite model with the correlation of the Upper Pliocene coal bearing formations from several sections in the western Dacic Basin, at the level of the ***Cochiti Subchron*** (**Gilbert Chron**; GPTS-CK95/ATNTS-2004). Related to the composite *Drănic Section*, the ***Cochiti Subchron*** was detected in the basal part of the "Drănic III" sub-section, while in the top of the "Drănic I" sub-section, the ***Brunhes Chron*** was identified within the *loess* deposits (see also Fig. 5) (from Rădan, S.C., 2013, in Rădan, S. *et al.*, 2013b: **R.-I.1**) (Figure included in the Poster given in Fig. 9).

For the first time, a possible interception of the *Matuyama / Brunhes boundary* (*MBB*) within the Romanian loess could be remarked (Fig. 7). Moreover, a very interesting correlation with the "*Lingtai section*" from the central *Chinese Loess Plateau* and with the detailed data of Spassov (2002) and of other authors is pointed out (Rădan, S.C., 2012: **R.-I.2**). This concerns the characteristics of the *MBB* location in the loess - palaeosoil sequences (*i.e.*, "observed" and "corrected"/"true" *MBB*). The possibly "*observed Matuyama / Brunhes boundary (MBB)*" is considered to be found within the loess **L8** (Fig. 7), and because of the "lock-in depth mechanism" taking place in sedimentary rocks, "resulting in an offset between the records and the true positions of magnetic reversals" (*e.g.*, Horng *et al.*, 2002), the "*corrected MBB*" is supposed to be located within the palaeosoil **S7**, corresponding to the *marine oxygen isotope stage 19*. A possible palaeosoil ***S8*** (?), located towards the Zimnicea borehole profile base (Fig. 7), could be calibrated to *MIS 21*, which means an age within the interval 0.801 – 0.861 Ma (Spassov, 2002) (more details, in Rădan, S.C., 2012: **R.-I.2**).



a) Variations of the magnetic susceptibility (**k**) with depth recorded for the loess - palaeosol sequence traversed by the Zimnicea (F3) geological borehole. *Legend*: **L** – loess horizon; **S** – palaeosol horizon. The green solid line in **L8** is the "observed Matuyama (**M**) / Brunhes (**B**) boundary" (MBB), as resulted from the palaeomagnetic data, and the bright green solid line shows the correlation with the "observed MBB" in L8 of Lingtai section (CLP), according to Spassov (2002). The green dashed line represents the "corrected/true MBB", located in **S7**, taking into account the delayed remanent magnetisation, whilst the dashed bright green line shows the correlation with the MBB located at the MIS 19 level in the marine oxygen isotope δ¹⁸O record at the ODP site 677 (Shackleton *et al.*, 1990); **b)** Variation with depth of the inclination of the Characteristic Remanent Magnetization (ChRM), after thermal cleaning, for a fragment of the Zimnicea borehole loess - palaeosol profile (between 25m - 30m depth); **c)** A fragment from the Pliocene – Pleistocene Geomagnetic Time Scale (ATNTS 2004; Lourens *et al.*, 2004). MBB – the same age (*i.e.*, 0.781 Ma), in ATNTS 2012 (Hilgen *et al.*, 2012).

d) Correlation between the marine oxygen isotope δ¹⁸O record at the ODP site 677 and the magnetic susceptibility variations with depth for the loess - palaeosol sequence (a fragment) at Lingtai (CLP). The red solid line in **L8** is the "observed MBB", whilst the dashed red line in **S7** represents the "corrected MBB". The age of the MBB is 778 ka according to Tauxe *et al.* (1996), cited by Spassov (2002) (figure reproduced from Spassov, 2002). *Note*: The MBB is located at 781 ka, according to ATNTS 2004 / ATNTS 2012.

Fig. 7. Composite model showing a tentative correlation of the integrated magnetic susceptibility and palaeomagnetic signatures recovered from the Zimnicea borehole profile* (Romanian Plain) with the Lingtai section from the Chinese Loess Plateau (CLP) (Spassov, 2002), the marine oxygen isotope δ^{18}O record at the ODP site 677 (Shackleton *et al.*, 1990), and a fragment from the Pliocene – Pleistocene Geomagnetic Time Scale (ATNTS 2004; Lourens *et al.*, 2004) (from Rădan, S.C., 2013, in Rădan, S. *et al.*, 2013b: **R. I.1**; see also Fig. 9A). **Note*: The powder samples and the semi-oriented (up/down) cubic specimens were collected by dr. Petru Enciu and provided to the Laboratory of Magnetism of Rocks and Sediments from the Geological Institute of Romania [Enciu, P., Berindei, F., Rădan S.C., Wanek, F.W. (2000)] (from Rădan, S.C., 2013, in Rădan, S. *et al.*, 2013b: **R.-I.1**) (Figure included in the Poster given in Fig. 9).

.

❍ Some **conclusive remarks** are finally mentioned.

The main aspects of the complex investigation of the Romanian loess were presented at two important Conferences: *2013 Meeting of INQUA – Section on European Quaternary Stratigraphy* (*SEQS*), 23rd – 27th September 2013, Constanţa (Romania) (Rădan, S. *et al*., 2013a,b: **R.-I.1**; Rădan, S.C., 2013: **R.-I.1**, **R.-I.2**, **R.-II;** see Fig. 8), and *2014 IGCP 596 & 580 Joint Meeting*, Mongolia, Ulaanbaatar, 5-18th August, 2014 (Rădan, S.C., 2014b: **R.-I.2**; Rădan, S.C., 2014: **R.-II**; see the note from *References* and Fig. 9). The response to the question from the paper's title (Fig. 8a) seems to be positive, the arguments being analysed in detail in the cited presentation (Rădan, S.C., 2013: **R.-II**), and shortly in this IAGA Report, while the three statements mentioned in the last slide (Fig. 8b) are confirmed by our investigations, so that we can accept that the loess approach is a complex undertaking, and the loess - palaeosoil sequences are indeed *very rich Quaternary archives for Geosciences*.

Fig. 8. The title (**a**) and some concluding statements (**b**), actually first and last slide, respectively from the "oral presentation" given at the *2013 Meeting of INQUA – Section on European Quaternary Stratigraphy* (*SEQS*), 23rd – 27th September 2013, Constanţa (Romania) (see *References*: Rădan, S.C., 2013: **R.-II**).

As regards the second review paper, presented at the above specified *2014 IGCP Meeting* in Mongolia (by the Dr. Sutton kindness – see *Note* from *References* - **Ch**. **II**: Rădan, S.C., 2014), the Poster is inserted below (Fig. 9).

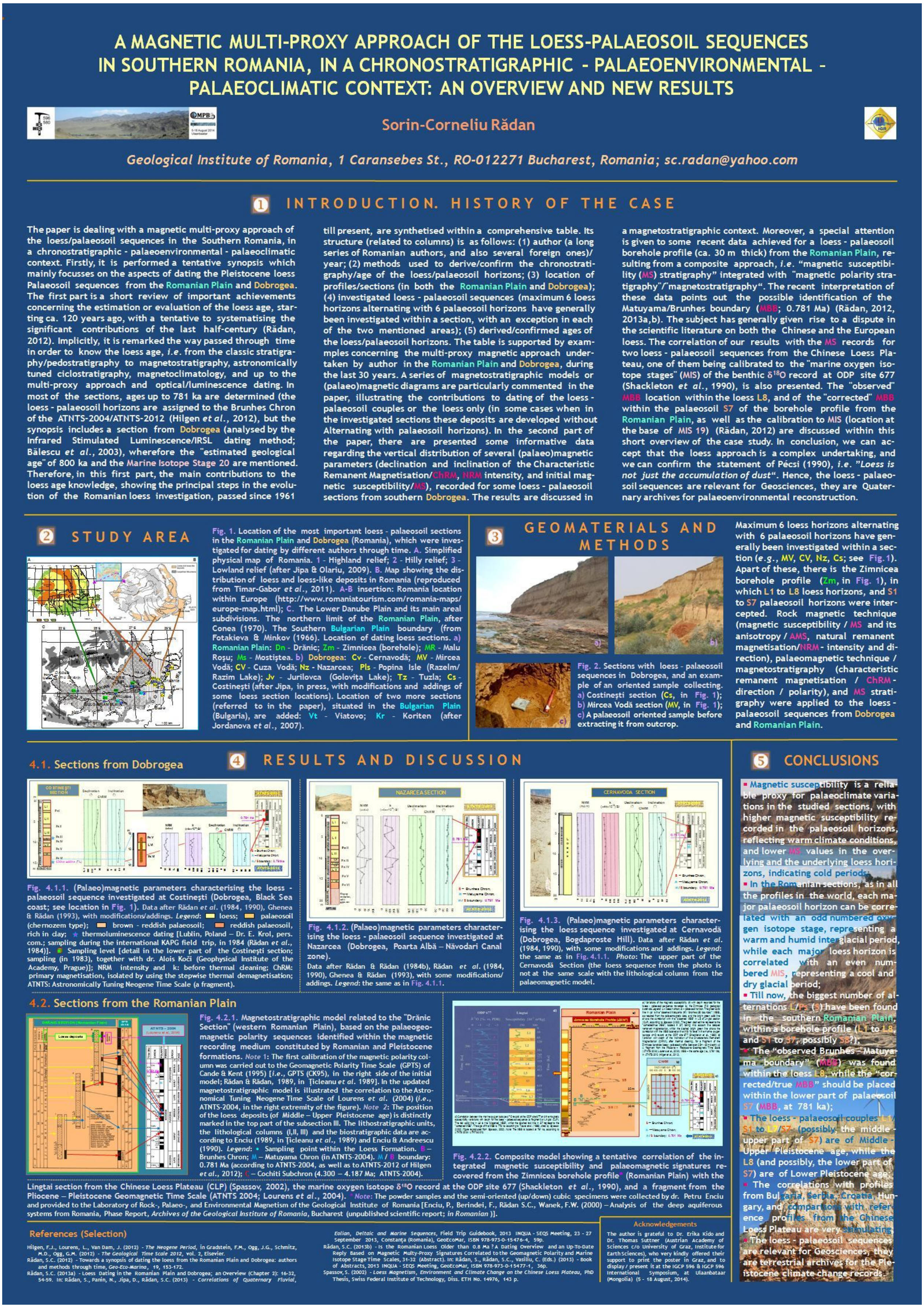
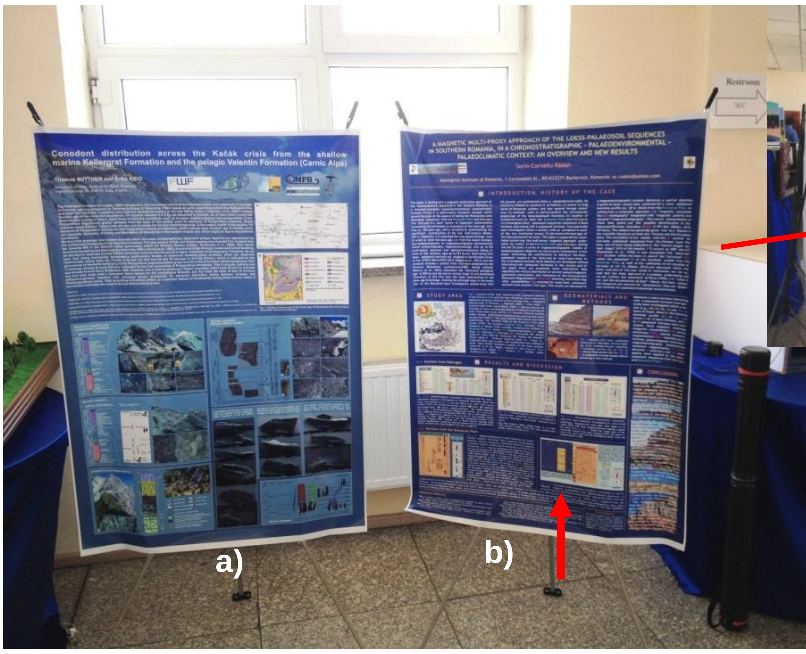


Fig. 9 A) The Poster paper presented at the *2014 IGCP 596 & 580*, Joint Meeting Mongolia, Ulaanbaatar, 5-18th August, 2014 [*Note*: Poster Presentation – due to the kindness of Dr. Thomas Suttner, from Karl-Franzens-Universität Graz, Austria; see more details in References (**II**): Rădan, S.C., 2014] (Rădan, S.C., 2014b: **R.-I.2**).



Photos by Thomas Suttner (*2014*)

B) Photos with the two posters exhibited/presented by Dr. Thomas Suttner (Karl - Franzens - Universität Graz, Austria), at the IGCP 596 & 580 Conference (Ulaanbaatar, Mongolia, 5-18 August 2014). **a)** Poster paper (authors: T. Suttner & E. Kido, Graz, Austria); **b)** Poster paper (the same, in **Fig. 9A**; author: S.C. Rădan, Bucharest, Romania); shown by the red arrow.

As concern the magnetic susceptibility variations related to the loess-palaeosoil couplets in the sections of the Romanian Plain and Dobrogea, some conclusive comments will be presented in the next Chapter (**2** - **WG-I.4**)**.** Anyway, we remark here, the biggest number of alternations **L**/**Ps (S)** – palaeomagnetically investigated by us, till now – have been found at Zimnicea (*Romanian Plain* - southernmost point), within a borehole profile (**L1** to **L8**, and **S1** to **S7**, possibly **S8**?) (Rădan, S.C., 2012: **R.-I.2**, and some references therein).

Finally, not forgeting the existent dispute on the reason of a disagreement between marine and loess records with regard to the *MBB* location (the ”lock-in depth" magnetisation mechanism), we consider as a tentative interpretation, based on the data enclosed in a published comprehensive Table, too (Rădan, S.C., 2012: **R.-I.2**; Rădan, S.C., in Rădan, S. *et al*., 2013b: **R.-I.1**), that the **L1** to **L8** are correlated with *MIS 4* to *MIS 20* (succession of even numbered ”*oxygen isotope stages*“/*OIS*), and **S1** to **S7** are calibrated to *MIS 5* to *MIS 19* (odd numbered *OIS*), spaning a time period of ca 800 ka (Fig. 7). Consequently, according to the Zimnicea borehole profile labelling (it seems to be the most complete sequence palaeomagnetically investigated in Romania), the loess - palaeosoil couplets **L1**/**S1** to **L7**/**S7** (possibly, the middle - upper part of **S7**) are of Middle Pleistocene - Upper Pleistocene age, while the **L8** (and possibly, the lower part of **S7**) are of Lower Pleistocene age. The arguments are based on the fact that the delayed Matuyama / Brunhes boundary (*MBB*) – because of the so-called ”lock-in depth mechanism“ – is downwards shifted in the “loess - palaeosoil column”, so that while the “*observed MBB*” was found within the loess **L8**, the ”*corrected*/*true MBB*“ should be placed within the lower part of palaeosoil **S7** (the *MBB* is dated – according to ATNTS2004 / ATNTS2012 – at 781 ka). In this context, it is worth to mention Conea (1970), who – based on the ”classic stratigraphy“ studies – assigns the group of soils **GS7**, identified in some sections from Dobrogea, to the ”*Günz-Mindel Interglacial and to older phases of the Lower Pleistocene*” (Table 1, in Rădan, S.C., 2012: **R.-I-2**; Rădan, S.C., in Rădan, S. *et al*., 2013b: **R.-I.1**).

It is also worth to remark the synopsis of the important achievements concerning the estimation or evaluation of the loess age, starting ca 120 years ago, with a tentative to systematising the significant contributions of the last half-century, carried out in the above-mentioned review-paper (Rădan, S.C., 2012: **R.-I.2**). Implicitly, it is revealed the way passed through time in order to improve the methods of dating the loess, *i.e.* from the classic stratigraphy/pedostratigraphy to magnetostratigraphy, astronomically tuned ciclostratigraphy, magnetoclimatology, and up to the multi-proxy approach and optical/luminescence dating.

❑ We keep up within the same *period*, *i.e.*, *Quaternary* – as we were placed in the previous section where we focused on another type of *couplets* ("loess - palaeosoil") –, and we are now presenting the main contributions published in the time interval 2011 – 2015 in connection with the investigation of *lignite-clay doublets*. These are commonly found within the Pliocene sedimentary sequences from southwestern part of Romania, between Jiu and Motru rivers, in the Western Dacic Basin (WDB) (Fig. 10A, B). Spectacular changes in magnetization were identified in clays present inside the "coal-bearing formations" (Fig. 11a). Such modification in magnetic property is a result of natural changes that have occurred under the influence of *coal fires*, and which resulted in new rocks formed – the porcellanites and/or clinkers [also known as "*combustion-metamorphic*" or "*pyrometamorphic*" rocks; *e.g*., Stracher, 2007 (Ed.)] (Fig. 11b,c). Deciphering the thermal history of a sequence is a complex process as it requires an integrated examination and interpretation of magnetic, petrological, mineralogical, and geochemical signatures of the units. Such a complex approach was adopted to interpret the *magnetic recording medium* of the coal-bearing formations within the WDB; there were analyzed geophysical, geological, and geochemical signatures of the WDB formations and discovered evidence of past coal-bed fires (*e.g*., Rădan, S.C. & Rădan, S., 2013a,b,c,d,e: R.-I.1). A series of results were also presented (Rădan, S.C., 2011: R.-I.3) inside of the previous "Report of the Romanian IAGA Section – Working Group I.3, Working Group I.4", as a part of the "*National Report on Geodetic and Geophysical Activities in Romania* (*2007 – 2011*)" (Sava, C. – Volume coordinator; see *References* - I.3). Therefore, here we add only some few data related to this subject, particularly some illustrations inserted inside the excellent book of Stracher, G.B., Prakash, A. and Sokol, E.V (2013), entitled "*Coal Fires*: *A Global Perspective. Volume 2*: *Photographs and Multimedia Tours*" – Chapter 17: "*Paleo-Coal Fires in the Western Dacic Basin, Romania*" (Rădan, S.C. and Rădan, S., 2013a,b: R.-I.1)

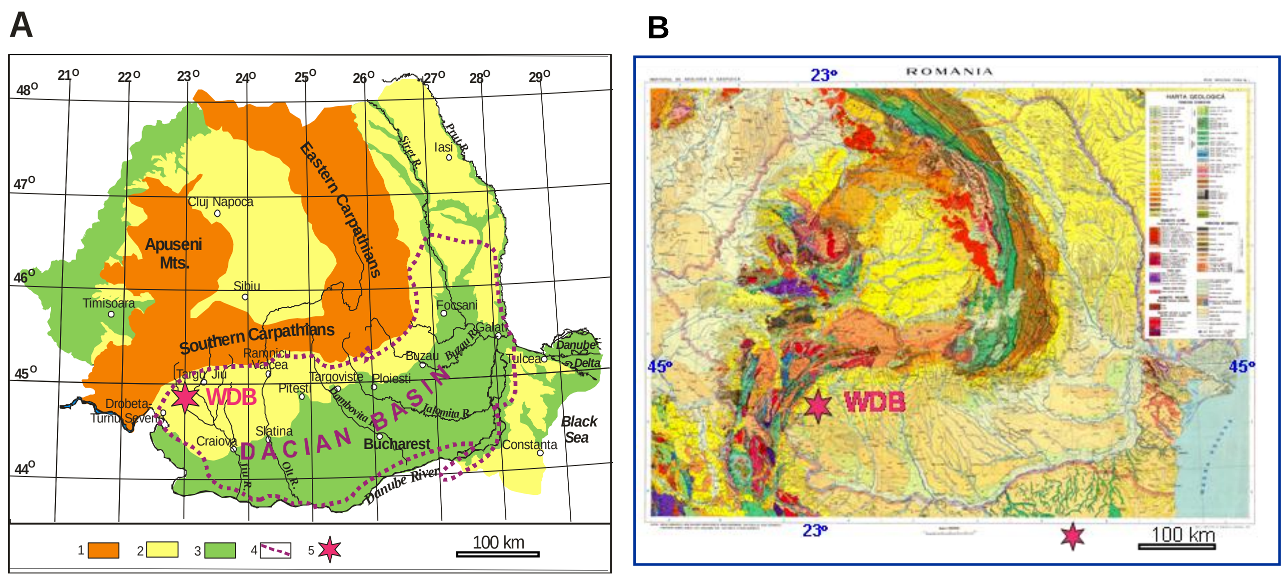


Fig.10. The Western Dacic Basin (WDB) in Romania, where porcellanites and clinkers of Middle-Upper Pleistocene age were sampled: (**A**) Simplified physical map of Romania with a dotted outline of the Dacic Basin, by Jipa & Olariu (2009): 1 - Highlands; 2 - Hilly topography; 3 - Lowlands; 4 - Outline of the Dacic Basin during the Romanian stage (Upper Pliocene); 5 - Study area. (**B**) Geological map of Romania (scale 1:1,000,000) by Sandulescu *et al*. (1978), Institute of Geology and Geophysics, Bucharest, Romania; digital version edited by the Geological Institute of Romania: 1 - Location of the study area (WDB) (from Rădan, S.C. & Rădan, S., 2013a,b: **R.-I.1**).

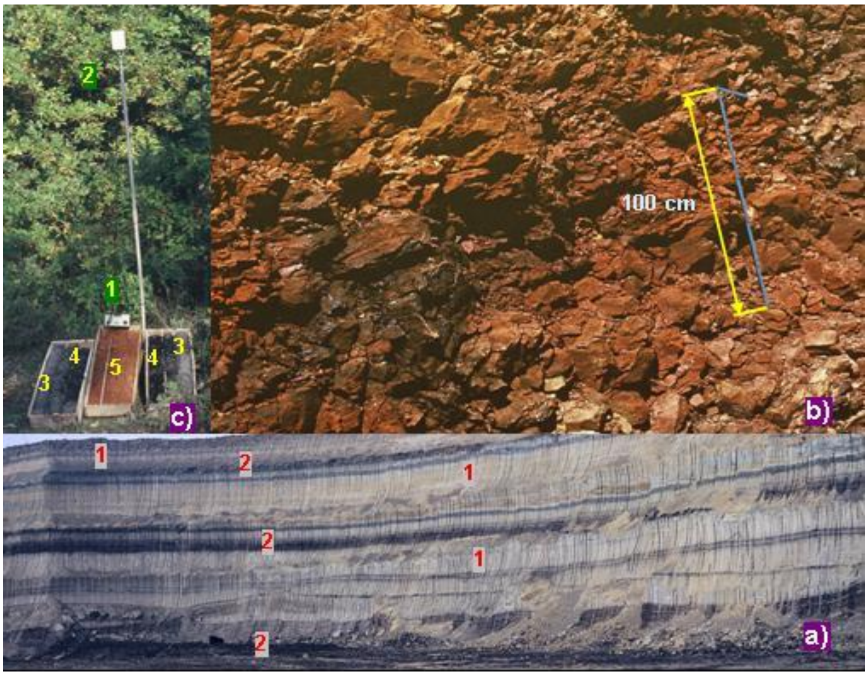


Fig. 11. Magnetic recording medium (*m.r.m.*) in Pliocene cyclic lignite-clay sequences and the pyrometamorphic fingerprints of Pleistocene underground coal fires that disturbed the *m.r.m.*, Lupoaia lignite quarry (Western Dacic Basin, Romania). The disturbed *m.r.m.* was first discovered in 1969 by magnetic field work: (**a**) Pliocene cyclic lignite-clay sequences in the quarry: **1**- clay deposits; **2** - lignite beds; (**b**) Baked clays (porcellanite and clinker), within the *m.r.m.*, burnt by combustion in coal-bearing formations; (**c**) The main constituents of the disturbed *m.r.m.*, recovered by exploration boreholes; located southward of the Lupoaia quarry at distances between 35 and 500 m from it: **1**, **2** - Geometrics portable magnetometer, used for magnetic mapping of the porcellanite and clinker deposits; **3** - clay cores extracted from the exploration boreholes; **4** - coal fragments; **5** - porcellanite fragments extracted from the exploration boreholes (from Rădan, S.C. & Rădan, S., 2013a,b: **R.-I.1**).

Yet, within this first Chapter (**1**) – **WG-I.3.**, we refer only to the *palaeomagnetic* investigation of the *lignite - clay doublets* from the *Western Dacic Basin*, inside of which – in certain places – the coal fires resulted in the occurrence of the porcellanites and/or clinkers. Therefore, we pesent some photos illustrating these "*combustion-metamorphic*" or "*pyrometamorphic*" rocks (Fig. 11b, Fig. 12), taken from our Chapter (**17**) published in the above-cited book of Stracher *et al*. (2013). Some significant rock-magnetic data will be mentioned in connection with the adequate **WG I.4**, in the second Chapter of the short Report for these two *IAGA Working Groups*.

Oriented specimens, which constituted the elements of quasi-instantaneous sampling of the *m.r.m.*, originated in both the initial thermally undisturbed *m.r.m.* and the *m.r.m.* affected by post-depositional thermal perturbations resulting from the coal fires. Single oriented samples of fresh clays not affected by heating, as well as of baked clays (porcellanites, porcellanite-like clays, clinkers) were collected from two lignite quarries in the WDB. Besides, oriented 25 cm-thick monolith-blocks (Fig. 13) were extracted from the *m.r.m.* and subsequently sliced at 2–5 levels. Also, a mini-section of about 4.5 m stratigraphic thickness, in an area with thermally affected clays, was also sampled in detail (Fig. 14A,B). These samples were used to investigate and understand the processes and the mineralogical and magnetic changes involved in the transition from clays to porcellanite-like clays. In addition, partially oriented (up/down) cores of fresh clays and unoriented fragments of porcellanites were collected from two exploration boreholes located southward of the Lupoaia quarry (Fig. 11c). For additional sample data, particularly referring to the composite Figure 11, see Rădan, S.C. & Rădan, S. (2013b: **R.-I.1**).

Fig. 12. Western Dacic Basin (WDB): from the cyclic deposition of Upper Pliocene lignite and clay (upper left) to the Pleistocene occurrence of coal fires that burned less than 0.781 Ma. Self-heating and spontaneous combustion of coal beds in the Jiu-Motru Formation produced "new rocks," *i.e.*, porcellanites and clinkers. Age determinations are based on magnetostratigraphic correlation of the porcellanite deposits with the Brunhes Chron of the ATNTS2004 (from Rădan, S.C. & Rădan, S., 2013a,b: **R.-I.1**).

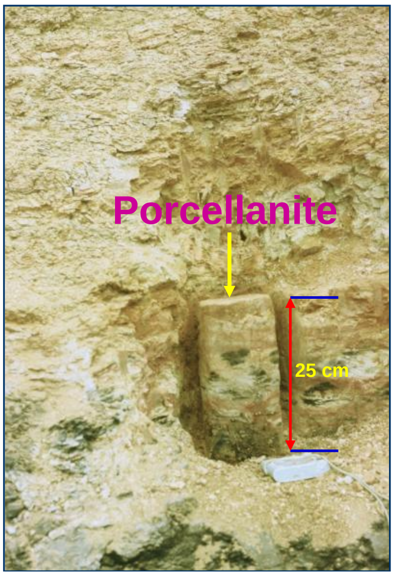


Fig. 13. Sampling site in the southern extremity of the Lupoaia Lignite Quarry (Western Dacic Basin). Enclosed in a clay lens is a clayey-porcellanite monolith in preparation for collecting and slicing for palaeomagnetic and mineralogical investigations. The clay lens (enclosing the monolith) is about 28 m in length. It is inside a coal bed that belongs to the Upper Pliocene Jiu-Motru Formation. The age of the clayey porcellanite, confirmed by palaeomagnetic studies, is Middle-Upper Pleistocene (from Rădan, S.C. & Rădan, S., 2013a,b: **R.-I.1**).

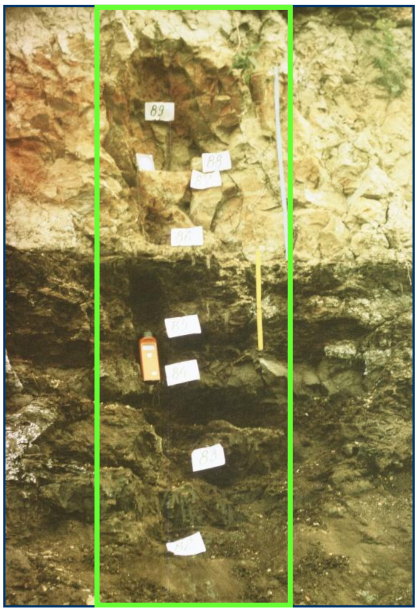


Fig. 14. Middle-Upper Pleistocene clinker, porcellanite, and reddish clay in the Lupoaia Lignite Quarry, Western Dacic Basin, Romania, sampled for rock magnetic, palaeomagnetic and mineralogical studies: Close up of the clay sequence (inside green rectangle), where samples were collected for study. Note the heated-red (also Middle-Upper Pleistocene) and reddish clay in and around the top half of the rectangle. Unburned clays belong to the Upper Pliocene Jiu-Motru Formation. The length of the portable kappameter, just below the center of the photo, is 19 cm (from Rădan, S.C. & Rădan, S., 2013a,b: **R.-I.1**).

The identified palaeomagnetic signal, carried out in the laboratory of G.I.R., shows the essential modifications suffered by the *m.r.m.* due to the post-depositional perturbations, as result of the natural coal palaeofires; changes of the geomagnetic record that had been fixed in the "fresh"/"original" rocks are produced. So, the thermally unaffected clays, characterizing the original ("initial") state of the *m.r.m.*, recorded a reversed polarity, whereas the "porcellanites", characterizing the modified ("subsequent") state of the *m.r.m.*, located in the vicinity of the "fresh" clays, have printed a normal polarity of the geomagnetic palaeofield. The former polarity zone is assigned to the Gilbert Chron, namely to the lower part of the C2Ar Subchron (ATNTS-2004/ATNTS2012; 4.187 – 3.596 Ma; Lourens *et al.*, 2004; Hilgen *et al.*, 2012), whereas the latter (related to the time clay was baked by naturally burning coal fires) is assigned to the Brunhes Chron (ATNTS-2004/ATNTS2012; 0.781 – 0.00 Ma).

Thus, the palaeogeomagnetic signature recovered from porcellanites, porcellanite-like clays and clinkers, and the evolution of the conditions of the sedimentary basin constrain the time of the coal seam burning in the investigated area in the Western Dacic Basin to the Middle-Upper Pleistocene. Other palaeomagnetic details were presented, also related to the IAGA **WG I.3**, in the previous National IUGG Reports, edited for the periods 2003-2007, and 2007-2011 (Rădan, S.C., 2011, in Sava, C., 2011: **R.-I.3**.), respectively. Moreover, the present *References* include several contributions concerning the palaeomagnetic characteristics of the lignite - clay sequences, not neglecting, of course, the porcellanites and/or clinkers (*e.g.*, Rădan, S.C. & Rădan, S., 2013c,d,e: **R.-I.1**; Rădan, S.C. & Rădan, S., 2011a,b,c,d, 2012, 2014, 2015: **R.-I.2**; Rădan, S.C. & Rădan, S., 2012: **R.-II**).

3. Rock- and Environmental Magnetism (WG I.4)

Related to the period under attention (2011 – 2015) for the National IUGG Report, we observe the new constitution of the IAGA "Working Group I.4", namely its composite title/definition. It is worth to remark, in our previous Reports, *e.g.*, Rădan, S.C. (2011, in Sava, C, 2011: **R.-I.3**), the third Chapter (**3**) was dedicated by us to "**Environmental Magnetism**". Consequently, now, as this field was officially included inside of an IAGA **WG** (*i.e.*, **I.4**), we present our last *enviromagnetic* results together with the main *rock-magnetic* data.

❑ Based on measurements on different types of rocks and sediments, the various applications of the magnetic susceptibility (**MS**) in geology, geophysics and geoecology were the subject of an "Oral presentation" at the IGCP 580 4th Annual Meeting: "*Magnetic Susceptibility and Gamma-Ray Spectrometry through time*", 24th – 30th June 2012, Graz, Austria (Rădan, S.C. & Rădan, S., 2012: **R.-I.2**; **R.-II**). The rocks have originated from outcrops, quarries or exploration wells, and the sediments from deltaic, lagoonal or marine sedimentary environments, respectively. Temporally, it was covered an interval between ca 380 Ma and Recent, and spatially, from Southern Carpathians to Danube, and from western Dacic Basin to Danube Delta and Northwestern Black Sea. The ***first case*** regarded an application of the magnetic susceptibility in geology. Starting from more than 50,000 **MS** values obtained for cores extracted from 37 exploration wells in the Iazuri – Vlădeasa area (Poiana Ruscă Mountains, Southern Carpathians), a series of magnetic susceptibility models (*e.g.*, **MS** vertical sections, and maps, in two versions) were carried out for the Devonian epimetamorphic schists (Rădan, S. & Rădan, S.C., 1980a, Rădan, S.C. & Rădan, S., 1980b, 1981). The magnetite bearing mineralisation distribution within the first complex was clearly outlined by means of the petromagnetic patterns. Also, a **MS** distribution pattern allowed the identification of several supply palaeodirections of the volcanogenic material and of the associated iron minerals. The existence of a submarine volcanic activity in the vicinity of the the Iazuri-Vlădeasa area, pointed out by petrographical methods (Mureşan, 1973), acquired thus a geophysical support, yielded by the *magnetic susceptibility* data.

❑ Before referring to the second case approached in the above-mentioned paper, we give some data also about some old rocks, *i.e.*, the *Cretaceous bauxites* which have constituted the subject of a paper accepted for presentation at the 2014 IGCP 596 & 580, Joint Meeting Mongolia, Ulaanbaatar, 5-18th August, 2014. Anyway, the abstract was published (Rădan, S.C., 2014a: **R.-I.2**), so that a series of results were thus presented. In the first Chapter (**1**) of this Report, we referred to the palaeomagnetic data obtained on *bauxites* (as the oldest rocks investigated by this method), the contributions being related to the IAGA **WG I.3**. The magnetism of *Cretaceous bauxites* from Pădurea Craiului (Apuseni Mountains, Romania) was also analysed in the context of the possible implications for near-surface lens exploration. So, the main goal was to test the capability of the geomagnetic investigation to detect the *bauxite lenses*. The magnetic contrast between the bauxite deposits and the limestones is strong enough to enable a successful magnetic mapping of the near-surface bauxite lenses, with the usual high resolution proton magnetometers. The primary magnetic maps revealed anomalies between ca 50 nT – 100 nT (Fig. 15a,c).

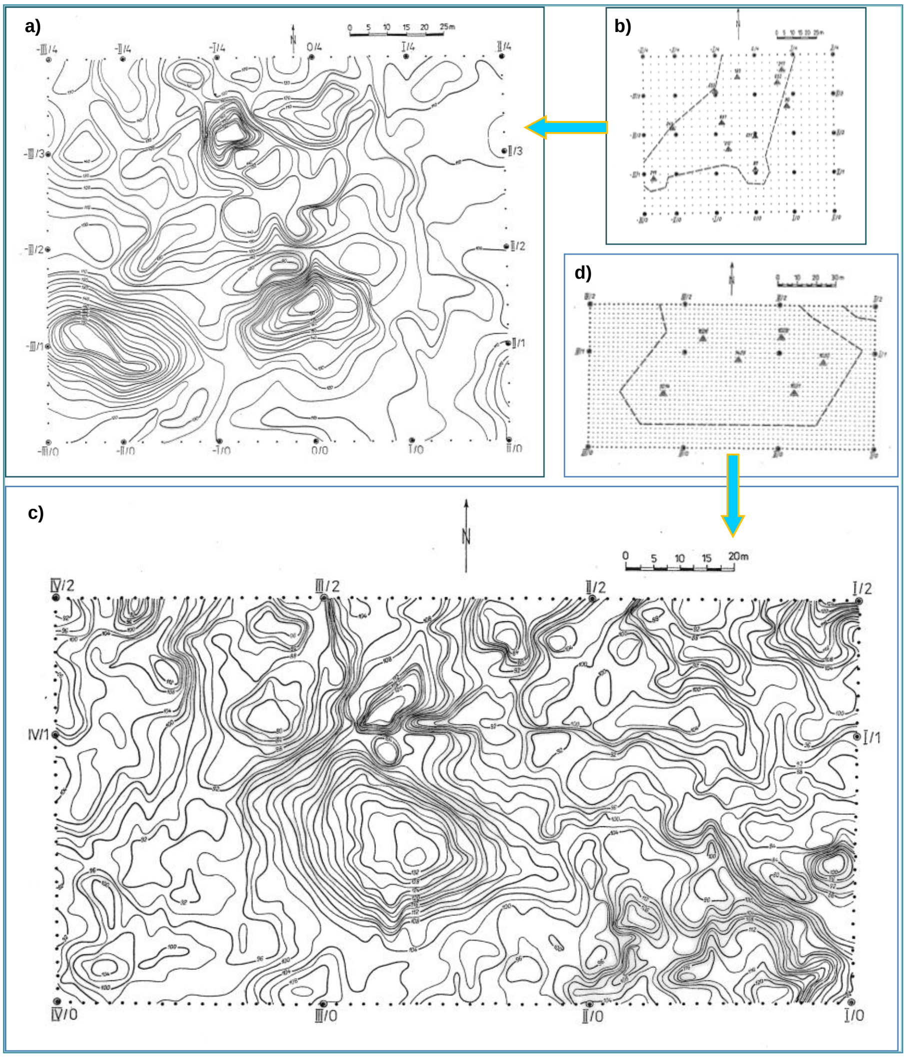


Fig. 15. **ΔT** magnetic maps showing the anomalies recorded over two bauxite lenses from Pădurea Craiului Mountains (Romania). **a)** magnetic map (5 nT contour equidistance), with 3 distinct anomalies (75 nT to 95 nT amplitudes) measured over bauxite deposits; **b)** quadratic network (5m side) and the contour of the bauxite lens over which the micromagnetic survey with the results from [**a**] was carried out; **c)** magnetic map (2.5 nT contour equidistance), with a distinct anomaly (54 nT amplitude) measured over the bauxite deposits; **d)** quadratic network (2.5 m side) and the contour of the bauxite lens over which the micromagnetic survey with the results from [**c**] was carried out (from Rădan, S.C., 2014a: **R.-I.2**).

❑ The ***second case*** discussed in the paper presented at the Graz IGCP 580 Meeting (Rădan, S.C. & Rădan, S., 2012: **R.-I.2**; **R.-II**) was dealing with the magnetic properties of the Pliocene coal bearing formations from the Western Dacic Basin (WDB), Southwestern Romania. We have discussed in the previous Section (WG-**I.3**) some palaeomagnetic results obtained on these lignite - clay sequences (not neglecting the age of porcellanites/clinkers). So, we mention here some *rock-magnetic* properties of the investigated rocks. Actually, it is a *case history* of the various signatures (*i.e.*, geophysical, geological and geochemical) which were discovered in this area and which provide evidence of past “coal fires” (Rădan, S.C. & Rădan, S., 2011a,b,c,d: **R.-I.2;** Rădan, S.C. & Rădan, S.: **R-II**). The rock magnetic signal, sent by the “baked clays”, is changed in comparison with the signal received from the “original” clays. The porcellanite deposits are able to produce significant magnetic anomalies; in the investigated area, amplitudes up to 1880 nT were measured (see Rădan, S.C., 2011, in Sava, C. – IUGG National Report, 2011 – **R.I.3**). Some information is given within the explanation of Fig. 14.

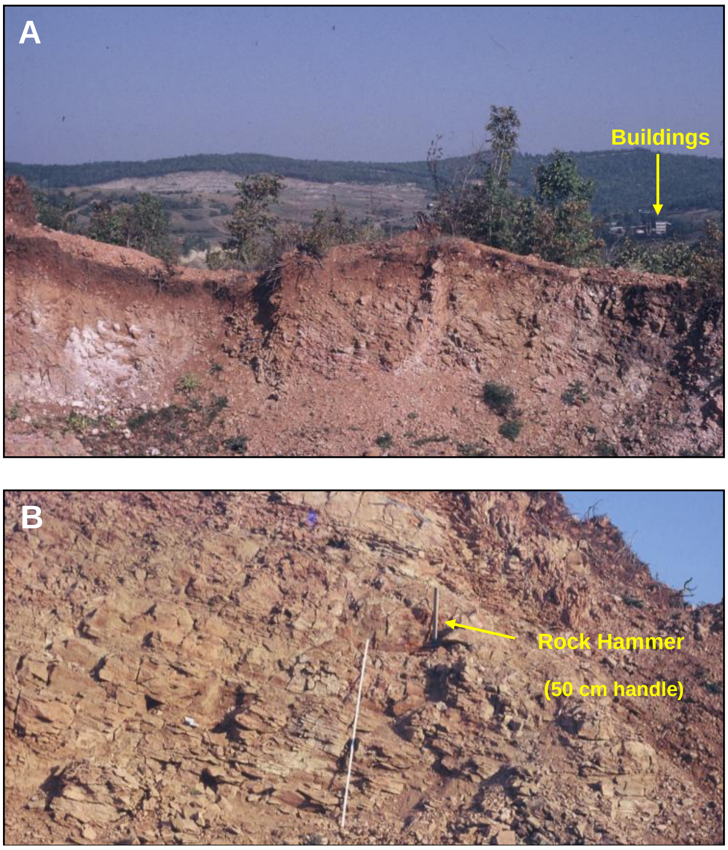


Fig. 14. Western Dacic Basin: (**A**) Porcellanite in the eastern part of the Lupoaia Lignite Quarry; (**B**) Sampling the bottom of an outcrop of porcellanite in the eastern extremity of the Lupoaia Lignite Quarry. A magnetic profile (445 m length), performed over the porcellanite deposit, yielded a 1400 nT magnetic anomaly. Porcellanite samples show high magnetic properties: the natural remanent magnetization intensity reaches 7,050 mA/m, and the magnetic susceptibility, $2{,}455\times10^{-6}\times 4\pi$ SI. Palaeomagnetic data support the assignment of these porcellanite deposits to the Middle-Upper Pleistocene, as in all cases analyzed in the Western Dacic Basin. Although the only porcellanite sample analyzed yielded the lowest values for the magnetic properties at this site, combustion metamorphic minerals were identified, *i.e.*, hematite and cristobalite (Rădan *et al*., 2001) (from Rădan, S.C. & Rădan, S., 2013a,b: **R.-.I.1**).

Spectacular changes were achieved – in "natural conditions" – by the magnetic properties of the clays inside the "coal-bearing formations". Due to certain lignite seams with availability for spontaneous ignition, changes comparable to the thermal metamorphism occurred, resulting in newly formed rocks: porcellanites and clinkers. These represent the consequences, and at the same time, the support of the mineralogical – petrological – geochemical – magnetic changes suffered by the clays, as an effect of the coal fires. Therefore, in two papers accepted for presentation (Rădan, S.C. & Rădan, S., 2011a,b,c,d: **R.-I.2**) at the 3rd International Meeting of "*Fire Effects on Soil Properties*" (Guimarães, Portugal, 15-19 March, 2011) we intended to analyse and give an answer – by using an interdisciplinary approach – to the question "*how coal fires affect the clays* ?"

One of the concluding remarks of another paper, accepted for presentation (Rădan, S.C. & Rădan, S., 2014: **R.-I.2**) at the International conference INQUA-SEQS 2014, Ekaterinburg, Russia (September 10 – 16, 2014) was that rocks spatially situated in an adjacent position, in the same stratigraphic horizon, or in a superposed position where they are up to 10 m apart, actually at the level of the coal bed X, differ in age by about 3.5 Ma. This is explained by the anomaly that occurs within the geomagnetic palaeofield record as a consequence of the thermal perturbation produced by underground coal fires, during the Middle-Upper Quaternary, inside a *m.r.m.* zone represented by Upper Pliocene cyclic lignite-clay sequences. In another paper (Rădan, S.C. & Rădan, S., 2015: **R.-I.2**), submitted to the XIXth INQUA Congress from Nagoya, Japan (27 July - 2 August, 2015), with a received "Notification of abstract acceptance" (10 February, 2015), we proposed to discuss some (palaeo)geomagnetic and (thermo)mineralogical data from Dacic Basin (Romania), in order to show the changes in the timing and magnitude of coal palaeofire activity consequences.

❑ Finally, before going to the "aquatic sedimentary environments", we stop again to the *loess - palaeosoil sequences* from *Dobrogea* and *Romanian Plain*, to which some palaeomagnetic characteristics were revealed in the first part of this Report, which was connected to the **WG I.3** activities. This time, we present some data which could represent contributions to the IAGA **WG I.4**.

The magnetic susceptibility variations related to the *loess-palaeosoil couplets* in the sections of the Romanian Plain and Dobrogea (Rădan, S. *et al*., 2013a,b: **R.-I.1**; Rădan, S.C., 2013: **R.-I.1**; Rădan, S. *et al*., 2015: **R.-I.2**; Rădan, S.C., 2012, 2013, 2014b,c: **R.-I.2**; Rădan, S.C., 2013, 2014: **R.-II**). As

Hambach *et al.* (2008) stated for the Chinese loess, these "*resemble the pattern of the global ice volume record with higher values in palaeosols (interglacials) and lower values in loess (glacials)*". Magnetic susceptibility is a reliable proxy for palaeoclimate variations in the studied sections, with higher magnetic susceptibility values recorded in the palaeosoil horizons, reflecting warm climate conditions, and lower magnetic susceptibilities in the overlying and the underlying loess horizons, indicating cold periods. In the Romanian sections, as in all the profiles in the world, each major palaeosoil horizon can be correlated with an odd numbered oxygen isotope stage, representing a warm and humid interglacial period, while each major loess horizon is correlated with an even numbered *MIS*, representing a cool and dry glacial period. Thus, the magnetic susceptibility signatures recovered from the Pleistocene loess - palaeosoil sequences in the two southern Romania areas can serve as a relative dating tool by using the benthic oxygen isotope record from ODP Site 677 (Shackleton *et al*., 1990). A synopsis of results is carried out within a comprehensive Table, attached to the papers/chapters of Rădan, S.C. (2012: **R.-I.2**) and Rădan, S.C. (2013: **R.-I.1**). The main contributions to the loess age knowledge, over the last half-century, are synthetised. Various methods were applied by a long series of Romanian authors, and also several foreign ones. Actually, the cited Table reflects the main steps in the evolution of the Romanian loess investigation, passed since 1961 till present, particularly with regard to its age. This is supported by several examples concerning the multi-proxy magnetic approach undertaken by the author both in the Romanian Plain and Dobrogea, during the last ca 30 years.

Till now, it seems the biggest number of alternations **L**/**Ps (S)** have been found at Zimnicea (*Romanian Plain* - southernmost point), within a borehole profile (**L1** to **L8**, and **S1** to **S7**, possibly **S8**?) (Rădan, S.C., 2012, 2013: **R.-I.2**, and some references therein; Rădan, S.C., 2013: **R.-II**), at "Tuzla" section (*Dobrogea*/close to the Black Sea shore), *i.e.* 7 doublets (**L1** to **L7**, and **S1** to **S7**) (Bălescu *et al*., 2003), and also 7 couplets, after some authors, at "Mircea Vodă" section (Rădan & Rădan, 1984a, in Ghenea *et al*., 1984; Rădan *et al*., 1990).

In certain synthesis/review papers, written by foreign and Romanian authors, some loess - palaeosoil sections from Romania were integrated within a series of complex patterns to be correlated with profiles from Bulgaria, Serbia, Croatia and Hungary. All these have also been compared with reference profiles from the Chinese Loess Plateau (CLP). Magnetic susceptibility records and magnetostratigraphic data were used in this respect and the correlation with the astronomically tuned benthic oxygen isotope record from ODP site 677 (Shackleton *et al*.,1990) and with the stacked normalized magnetic susceptibility curves recorded for CLP sections (*e.g*., at Lingtai) was carried out.

Together with the confirmation of the statements from Fig. 8, we add at the end of this very short sub-section of **WG I.4** that the loess - palaeosoil sequences are relevant for palaeoenvironmental reconstruction, and as Hambach *et al*. (2012) consider, they are "*some of the most detailed and long-term terrestrial records of Pleistocene climate change*".

❑ Coming back to the paper approaching three *case studies* (Rădan, S.C. & Rădan, S., 2012: **R.-I.2**; **R.-II**), presented at the IGCP 580 4th Annual Meeting: "*Magnetic Susceptibility and Gamma-Ray Spectrometry through time*", held in Graz, Austria (24th – 30th June 2012), we continue now with the ***last case***, which regards the use of the magnetic susceptibility as an investigation tool in *aquatic sedimentary environments*.

A vast "enviromagnetic archive" of recent sediments from *Danube Delta* (DD), *Razim* (*Razelm*) – *Sinoie Lagoonal Complex* (RSLC), *Black Sea Littoral Zone* (BSLZ) and *Northwestern Black Sea* (NWBS) (Fig. 15) has been sampled over about 40 years. In fact, a lot of applications were carried out on recent sediments, along the time interval under attention in this Report, so that we are going to mention most important of them. The most extended data bank belongs to the *deltaic – lagoonal system* (DD – RSLC) and is based on thousands of (sub)samples collected during the cruises carried out at least annually in the 1976 – 2015 period.

Based on a large database of magnetic susceptibility (**MS**; **k**) measurements on surficial sediments from lakes and channels of the *Danube Delta* (Fig. 16), and on the **MS** and lithological (**LITHO**) records achieved for a number of sediment cores extracted from the most important deltaic geo-environments, the assessment of the *stratigraphic* potential of the integrated **MS - LITHO** characteristics for this singularly interesting area was a special goal.

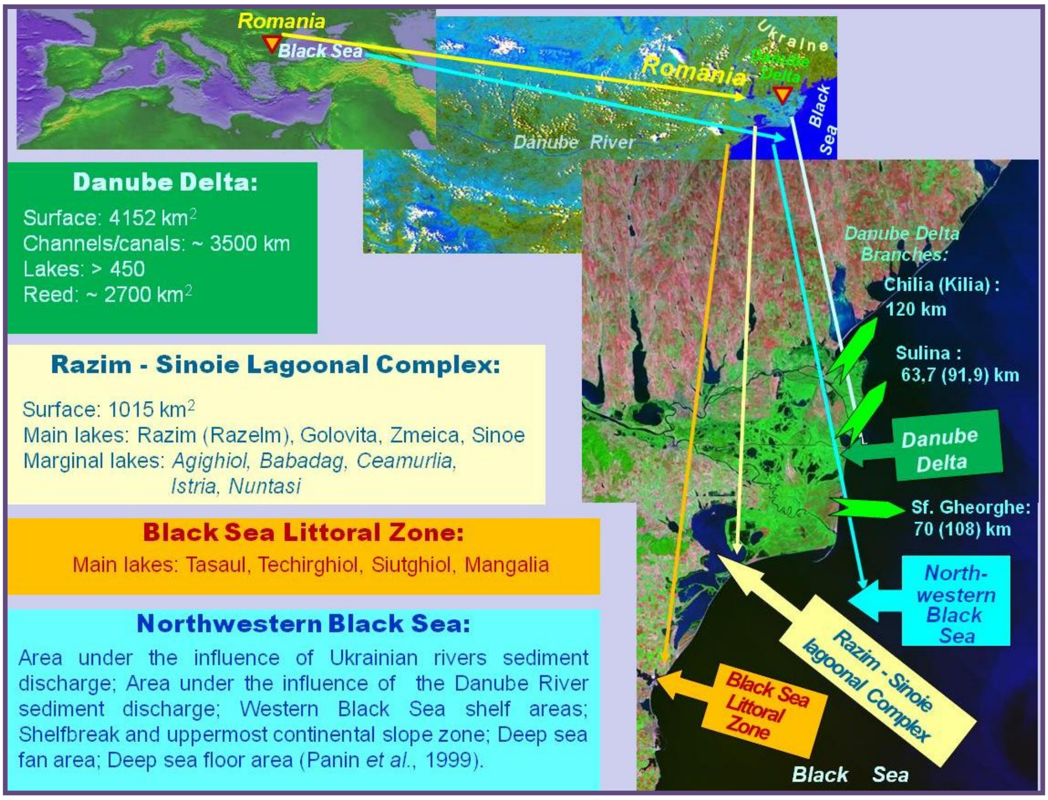


Fig. 15. Location of the aquatic areas wherefrom the enviromagnetic archives were recovered.

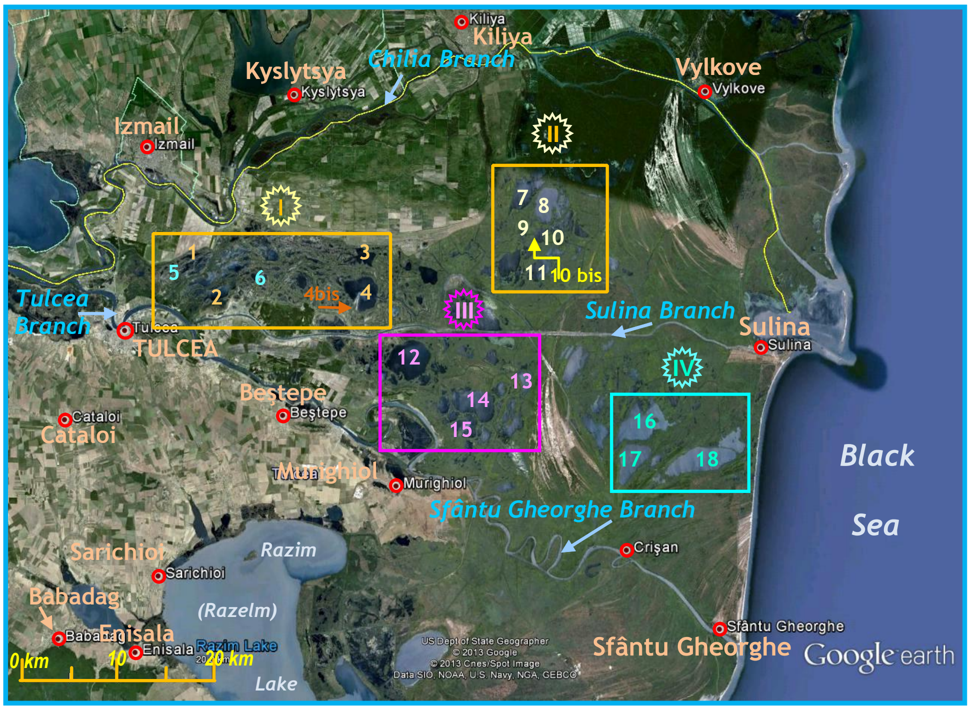


Fig. 16. Location of the lakes in the Danube Delta from where sediment cores were collected over the 2010 − 2015 period. **I**. *Meşteru − Fortuna Depression*: 1 − Cuteţchi Lake; 2 − Tătaru Lake; 3 − Băclăneşti Lake; 4 − Fortuna Lake; 4bis − Crânjală Canal; 5 − Trofilca Lake; 6 − Belâi Lake. **II**. *Matiţa − Merhei Depression*: 7 − Babina Lake; 8 - Matiţa Lake; 9 − Polideanca - Lopatna Swamp; 10 − Polideanca Lake; 11 − Bogdaproste Lake; 10bis − Lopatna - Polideanca Canal. **III**. *Gorgova − Uzlina Depression*: 12 − Gorgova Lake; 13 − Cuibeda Lake; 14 − Isacova Lake; 15 − Uzlina Lake. **IV**. *Lumina − Roşu Depression*: 16 − Lumina Lake; 17 − Puiu Lake; 18 − Roşu Lake. *Notes*: **I, II** − Areas with recently published synoptic data (Rădan *et al*., 2013a, 2014a: **R.-I.2**); **III** − Area under attention for data synopsis publishing (*e.g*., Rădan *et al*., 2015b: **R.-I.2**); **IV** − Deltaic area from where the results are to be next synthetized within a review paper.

The surficial/bottom sediments (taken with grab-samplers) give information from the first ca. 20 cm beneath the water/sediment interface, while the sediment columns (provided by a Hydro-Bios type core sampler) were extracted from up to ca. 60 cm depth. Most papers have mainly dealt with the **MS** and **LITHO** signatures recovered from surficial sediments (see Rădan, S.C. & Rădan,S., 2011e: **R.-I.2**, for a brief overview and references; also, Rădan, S.C. *et al*., 2014b,c: **R.-I.2**), but during the last years the attention was dedicated to the sediment cores (Rădan *et al*., 2012a,b,c: **R.-I.2**), particularly extracted from specific deltaic subunits/depressions (*e.g*., Rădan *et al*., 2013a, 2014a, 2015b/abstract: **R.-I.2**).

The **MS – LITHO** data provided by the sediment cores are very important in the context of deciphering the spatial and temporal evolution of the deltaic geosystem. Actually, the paper was specially dedicated to assess the capabilities of the magnetosusceptibility and lithological records for *stratigraphic* studies in the Danube Delta geosystems.

This new direction – the *stratigraphy* of the recent sediment sequences – is possibly to be initiated by the synoptic images which present the **MS** (*e.g*., Fig. 17) and **LITHO** (*e.g*., Fig. 18) profiles recorded along each sediment core, placed in the lakes from where they were extracted. The studied cores are short (around 55.5 cm), yet some distinct features are seen in the most of them.

Even the use of the **MS** as a correlation tool is positively discussed in the literature, in a series of cases to match the **k** peaks identified in some cores within a lake or in several cores from different lakes (Fig. 17) is difficult to really carry out (*e.g*., Trodahl, 2010, and references therein). In order to fulfill the *stratigraphic* goal, the **MS** records must be supplemented with data provided by other proxy parameters.

The correlation coefficients calculated for pairs of **k** values and **LITHO** contents, or pairs of **LITHO** component contents attest, in most cases, a feasible lithological support for the magnetosusceptibility records retrieved from the investigated geo-environments. Particularly, high and very high positive correlations for **SIL** *vs*. **MS**, and, correspondingly, high and very high negative correlations for **TOM** *vs*. **MS** were achieved (Rădan, S.C. *et al.*, 2014a: **R.-I.2**).

Besides, the anthropogenic influence on some lakes was also inferred from the **MS** data analysis. On the other hand, in a favourable case, the sedimentation rate was possibly to be determined on the basis of the magnetosusceptibility model carried out for a sediment core (Rădan *et al*., 2013a: **R.-I.2**).

The integrated magneto-lithological study has resulted in the detection, in several sediment cores, of some marine deposits located very close of the water/sediment interface (several examples in Fig. 19). Anyway, we can mention that to set off some marine deposits very close of the actual water/sediment interface is very important for the deltaic system evolution knowledge, taking into consideration that these are located behind of the initial *Jibrieni – Letea – Caraorman sand ridge*, and thence older than this one. The presence of the marine fauna (*e.g*., *Cardiidae*) inside of certain studied cores, at a low depth, corresponds either the former period of the initial belt, or slightly afterwards, related to an incipient phase, when the Danube bay sluicing had not been settled into shape. Therefore, it is very interesting these cores which remark the existense of a marine episode at west of the *Letea – Caraorman initial belt* were extracted from two lakes and a channel situated in the *Matiţa – Merhei Depression*, which, at present, is a part of the *Fluvial Delta Plain*. Certainly, an absolute age analysis, supported by the identified fauna within the respective cores, could help to clarify some aspects of the controversy relating to the development in time of the different events which led to the deltaic edifice building up.

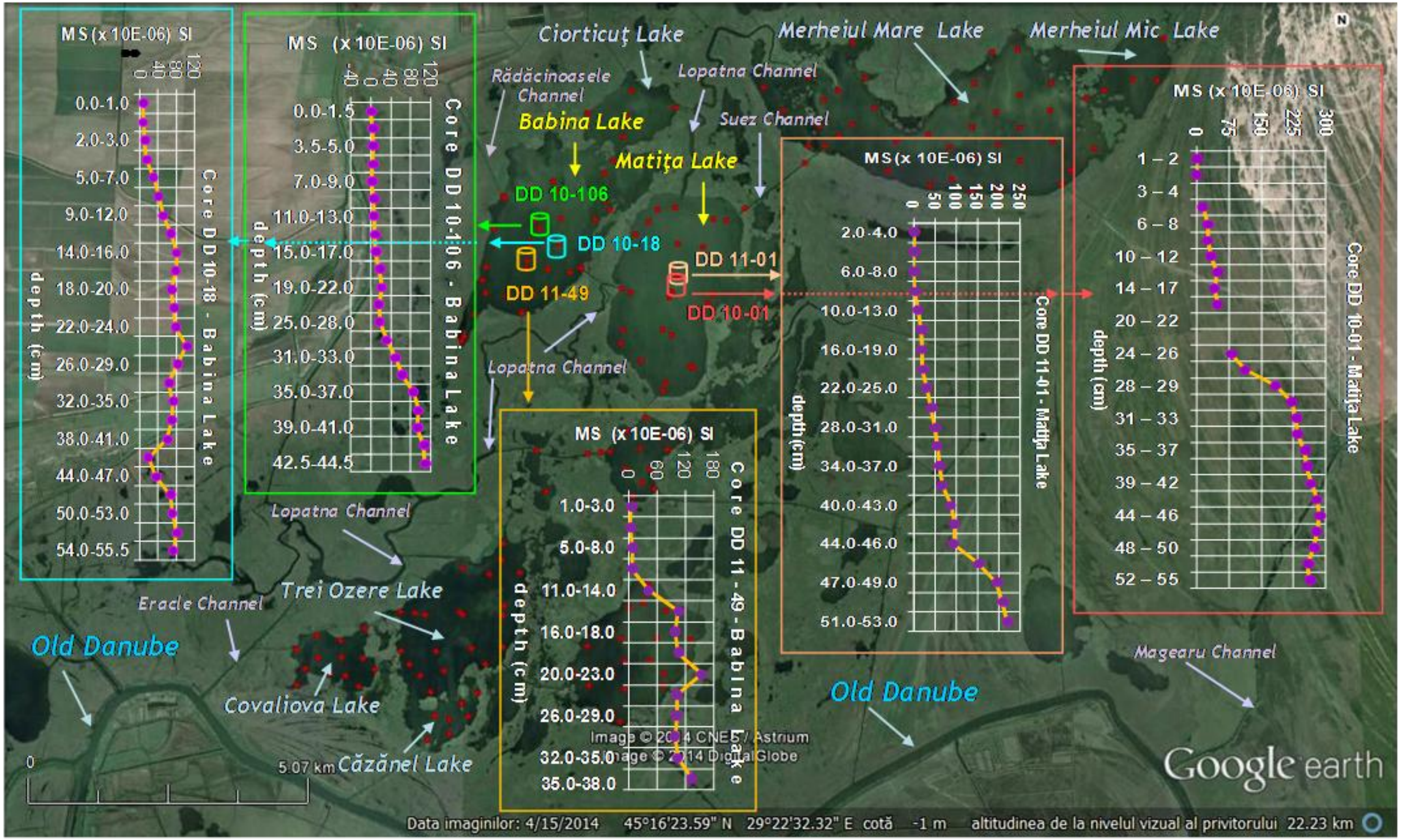


Fig. 17. An example of magnetosusceptibility (**MS**) records achieved for five sediment cores collected from two lakes of the Matiţa - Merhei Depression (*i.e.*, Babina L. and Matiţa L.), northeastern Danube Delta (Romania). *Legend*. The red points located on the map within the lakes and along some channels denote the grab sampling stations. The coloured cylinders drawn within the Babina and Matiţa lakes mark the sampling sites for the sediment cores (from Rădan *et al*., 2014a: **R.-I.2**).

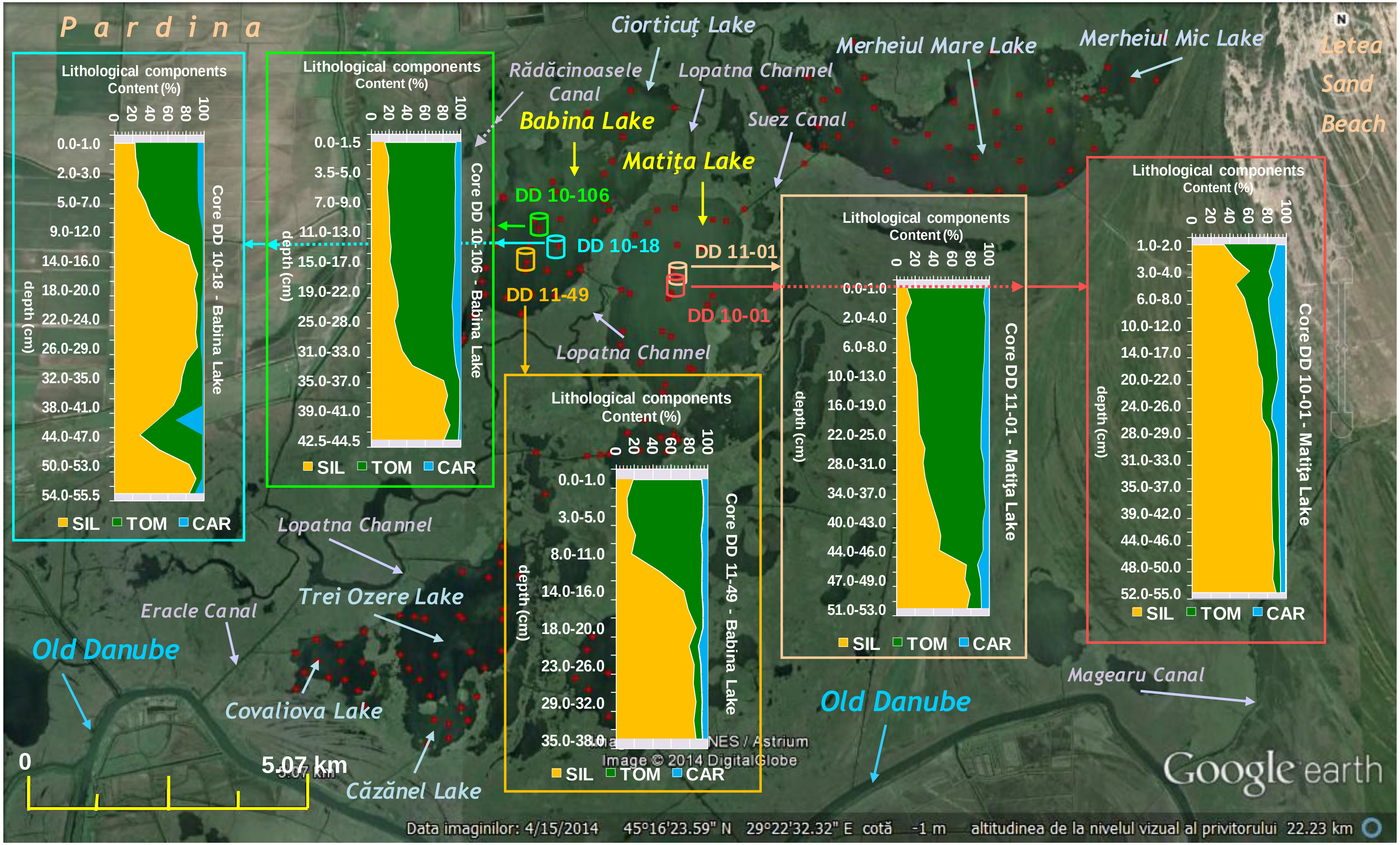


Fig. 18. Synoptic image with the composite lithological (**SIL**, **TOM**, **CAR**) records achieved for five sediment cores collected from two lakes (*i.e.*, Babina and Matița) in the northern half of Matița – Merhei Depression. *Legend*. The red points located on the map within the lakes and along some channels denote the grab sampling stations (over the period 2010 – 2014). The coloured cylinders drawn within the Babina and Matița lakes mark the collecting sites for the sediment cores (from Rădan *et al*., 2014a: **R.-I.2**).

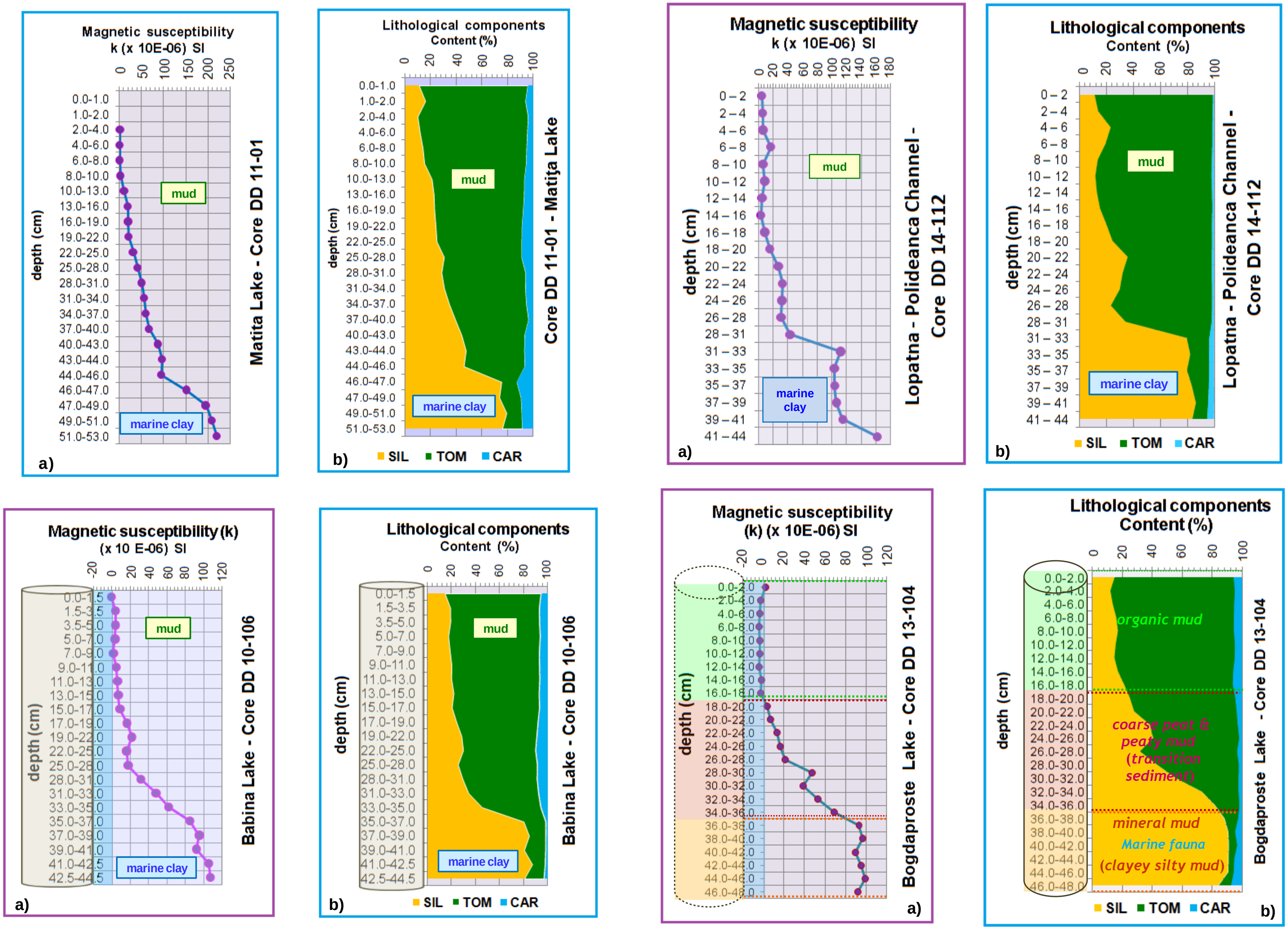


Fig. 19. Vertical distribution of the enviromagnetic parameter values (**k**) and of lithological components contents (**SIL**, **TOM**, **CAR**), along four sediment cores, collected from lakes (Matiţa, Babina, Bogdaproste) and channels (Lopatna - Polideanca Ch.) from Matiţa - Merhei Depression (Danube Delta, Romania). **a)** Line-charts showing the magnetic susceptibility vertical profile. *Note*: in blue, is zone with negative **k** values; **b)** 100% stacked area-charts with the distribution of **SIL**, **TOM** and **CAR** contents along the sediment cores.

A synoptic image of the magnetic susceptibility calibration of the *Matiţa – Merhei Depression* lake sediments is given as example in Fig. 20, by using **MS** cubs which are coloured according to the **k** classes of the **MS** scale (Rădan, S.C. & Rădan, S., 2007) and are located in the sampling stations from each lake/channel investigated during the last five years. Pie-charts, with the **k** classes to which the surficial sediments were calibrated, are associated to the respective lakes of *M. – M. D.* (Fig. 20). As regards the lithological composition of the bottom sediments, a pie-chart with the content weights of the main **LITHO** components *(i.e*., **SIL**, **TOM** and **CAR**) is placed close of each **MS** pie-chart, and both of them are associated with each lake from this master monitoring deltaic area (Fig. 20).

All these maps and diagrams show the most significant magneto-lithological characteristics of the *M. – M. D.* lacustrine sediments. It is easily to note their dominant feature, namely the calibration to the lowest **k** class (values under 10×10^{-6} SI, negative ones included), *i.e.* class **I** (Fig. 20), assigned to the "*fine sediments, rich in organic matter and/or carbonates*".

The core parallel analysis, supported by the lithological, sedimentological, faunistic and other complementary data, could generate interesting applications in the future, in a *stratigraphic* context. The 2D area-charts with the vertical distribution of the three main lithological components, particularly the **SIL** and **TOM** diagrams, analysed in detail, but in the same time in connection with the **MS** profiles and other known parameters, are also of use in testing the capabilities of the investigated cores for stratigrapghic applications in deltaic environments.

Besides, the high correlation coefficients which caharacterise the relationships concerning the susceptibility (**MS**) and the siliciclastic/detrital material (**SIL**), which is present, in more or less quantity, within the sediment core composition, can constitute arguments towards the *proxy* quality assignment of the ***magnetic parameter*** as *environmental and minerogenic fingerprinting tool*, one of the main objectives towards which our new contributions are directed at present and in the future (*e.g*., Rădan *et al*., 2015a: **R.-I.2**).

The quality of proxy environmental parameter of the magnetic susceptibility was even more demonstrated by a series of examples presented for the modern sediments sampled in the lakes of the *Razim (Razelm) – Sinoie Lagoonal Complex* (*e.g*., Rădan, S.C. & Rădan, S., 2011e; Rădan, S.C. *et al*., 2012d: **R.-I.2**; Rădan, S.C. & Rădan, S., 2012: **R.-II**; Rădan, S.C. *et al*., 2011a: **R.-II**), for which a large database is constituted, also for four lakes of the *Black Sea Littoral Zone* (*e.g*., Rădan, S.C. & Rădan, S., 2011e; Rădan, S.C. *et al*., 2012e,f,g: **R.-I.2**; Rădan, S.C. & Rădan, S., 2012: **R.-II**; Rădan, S.C. *et al*., 2011b, 2012c: **R.-II**), as well as in the *Northwestern Black Sea* (location, in Fig. 15; *e.g*., Rădan, S.C. & Rădan, S., 2011e: **R.-I.2**; Rădan, S.C. & Rădan, S., 2012: **R.-II**). The references can be completed by using the "*Book of Abstracts*" - No. **1**, edited by L. Török (2013), in which the abstracts of the papers associated with the Symposia "*DELTAS AND WETLANDS*", held annualy, in the 2001 – 2013 period, are published. Consequently, according to *References* of this *IAGA Report*, we cite the ones placed within the time interval 2011 – 2013: Dimitriu *et al*. (2013a,b,c: **R.-I.2**), Rădan, S.C. & Rădan, S. (2013a,b,c,d,e: **R.-I.2**); Rădan, S.C. *et al*. (2013b,c,d,e,f: **R.-I.2**). Finally, we add new and the latest contributions (submitted/accepted abstracts): Rădan, S.C. *et al*. 2014d: **R.-I.2**, Rădan, S.C. *et al*., 2015a,b,c: **R.-I.2**.

In conclusion, we remark, again, that the validity of the Verosub & Roberts (1995) statement, *i.e*. "*many types of studies that are now classified as environmental magnetism have been in existence for some time*", is clearly proved by the enviromagnetic archives recovered from the modern sediments, sampled during 1976-2015 period, in various aquatic environments from the *Danube – Danube Delta – Black Sea macro-system*.

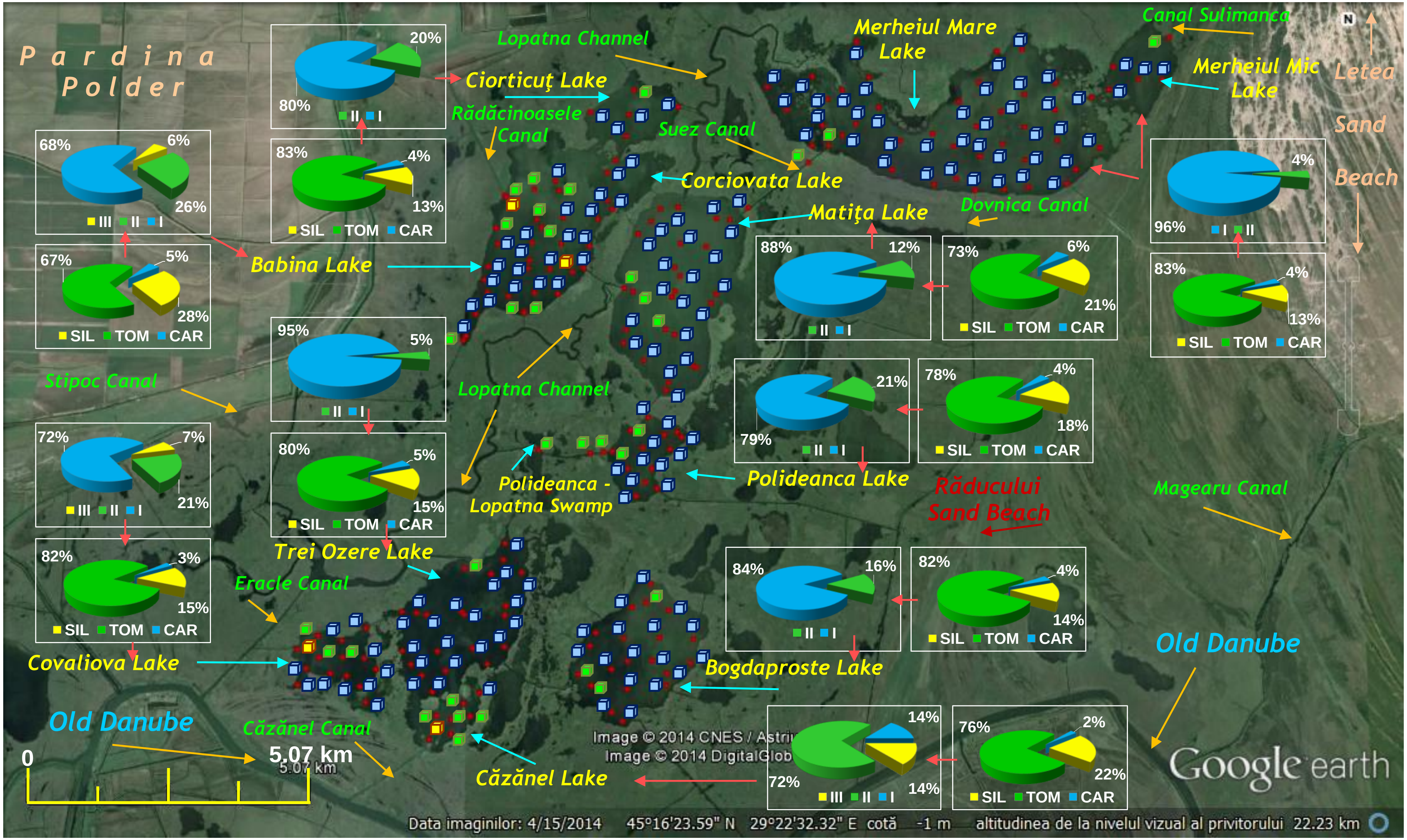


Fig. 20. Synoptic image with the 3D pie-charts showing the **MS** calibration (by using the **k** scale classes) and the lithological composition (based on the contents of **SIL**, **TOM** and **CAR** components) of the surficial sediments sampled with a bottom-hole grab, in the lakes and some swamps and channels from the Matiţa – Merhei Depression, over the period 2010 – 2014 (from Rădan, S.C. *et al.*, 2014a: **R.-I.2**).

References

I. Publications

I.1. Contributions to Books, Special Volumes, Geophysical – Geological Field Trip Guidebooks

Rădan, S., Rădan, S.-C., Vasiliu, C. (Eds.) (2013a) – *Correlations of Quaternary Fluvial, Eolian, Deltaic and Marine Sequences*, Book of Abstracts, 2013 Meeting of INQUA – Section on European Quaternary Stratigraphy (SEQS), 23rd – 27th September 2013, Constanţa (Romania), GeoEcoMar, Bucharest, ISBN 978-973-0-15477-1, 36p. http://www.inqua-seqs.org/files/Book_of_Abstracts.pdf (accessed April 2015)

Rădan, S., Panin, N., Jipa, D., Rădan, S.-C. (2013b) – *Correlations of Quaternary Fluvial, Eolian, Deltaic and Marine Sequences*, Field Trip Guidebook, 2013 Meeting of INQUA – Section on European Quaternary Stratigraphy (SEQS), 23rd – 27th September 2013, Constanţa (Romania), GeoEcoMar, Bucharest, ISBN 978-973-0-15476-4, 59p. http://www.inqua-seqs.org/files/Field_Trip_Guidebook.pdf (accessed April 2015)

Rădan, S.-C. (2013) – *Loess Dating in the Romanian Plain and Dobrogea; an Overview* (Chapter **2**), 16-32, 54-59. In: Rădan, S., Panin, N., Jipa, D., **Rădan, S.C.** (2013b) – *Correlations of Quaternary Fluvial, Eolian, Deltaic and Marine Sequences*, Field Trip Guidebook, 2013 Meeting of INQUA – Section on European Quaternary Stratigraphy (SEQS), 23rd – 27th September 2013, Constanţa (Romania), GeoEcoMar, Bucharest, ISBN 978-973-0-15476-4, 59p.

Rădan, S.-C., Rădan, S. (2013a) – Chapter 17: *Paleo-Coal Fires in the Western Dacic Basin, Romania*, 338-349. In: Stracher, G.B., Prakash, A., and Sokol, E.V. (Eds.), *Coal and Peat Fires: A Global Perspective*, Volume **2**: *Photographs and Multimedia Tours*, Elsevier B.V., 584p. http://booksite.elsevier.com/9780444594129/chapter_17.php (accessed April, 2015)

Rădan, S.-C., Rădan, S. (2013b) – Chapter 17: *Sample Data. Additional information relating to the Front Page Composite Figure*. In: Stracher, G.B., Prakash, A., and Sokol, E.V. (Eds.), *Coal and Peat Fires: A Global Perspective*, Volume **2**: *Photographs and Multimedia Tours,* Companion Materials, Elsevier B.V., 584p. http://booksite.elsevier.com/9780444594129/content/Stracher-et-al._Coal-Fires_Vol.2_On-line_Multimedia_Chapter-17_Sample-Data_Front.Page.Photo_Additional-Information_RADAN.pdf (accessed April, 2015)

Rădan, S.-C., Rădan, S. (2013c) – Presentation at the Twelfth Castle Meeting on New Trends in Geomagnetism, Castle of Nové Hrady, Southern Bohemia, Czech Republic, 2010: *Coal Paleofires in the Western Dacic Basin (Romania): Geophysical, Mineralogical and Geochemical Signatures Recovered From Porcelanites and Clinkers; A Case History*. In: Stracher, G.B., Prakash, A., and Sokol, E.V. (eds.), *Coal and Peat Fires: A Global Perspective*, Volume **2**: *Photographs and Multimedia Tours*, Companion Materials – Videos and Presentations, Elsevier B.V., 584p. http://booksite.elsevier.com/9780444594129/content/Stracher-et-al_Coal-Fires_Vol.2_On-line_Companion-Materials_Poster_Castle.Meeting-2010_ RADAN.pdf (accessed April, 2015).

Rădan, S.-C., Rădan, S. (2013d) – Presentation at Second International Conference on Coal Fire Research, Berlin, Germany, 2010: *Coal Paleofires in the Western Dacic Basin: Geophysical, Mineralogical, and Geochemical Signatures Recovered from Porcelanites and Clinkers; A Case History*. In: Stracher, G.B., Prakash, A., and Sokol, E.V. (Eds.), *Coal and Peat Fires: A Global Perspective*, Volume **2**: *Photographs and Multimedia Tours,* Companion Materials – Videos and Presentations, Elsevier B.V., 584p. http://booksite.elsevier.com/9780444594129/ content/Stracher-et-al._Coal-Fires_vol.2_2012_On-line_Multimedia_Companion-Materials_ Presentations_Poster_ICCFR2-Berlin_Coal-Fires_ RADAN.pdf (accessed April, 2015).

Rădan, S.-C., Rădan, S. (2013e) – Presentation at the XXIVth General Assembly of the IUGG, Perugia Italy, 2007: *Remagnetization as Evidence of a Natural Thermal Event in the History of the Pliocene Lignite-Clay Sequences: Magnetic Signals from Porcelanites (Dacian Basin, Romania)*. In: Stracher, G.B., Prakash, A., and Sokol, E.V. (Eds.), *Coal and Peat Fires: A Global Perspective*, Volume **2**: *Photographs and Multimedia Tours,* Companion Materials – Videos and Presentations, Elsevier B.V., 584p. http:// booksite.elsevier.com/9780444594129/ downloads/xxivth_general_assembly_of_the_iugg/sorin-corneliu_radan.pdf

Rădan, S., Panin, N., Catto, N.R., Rădan S.-C. (*Guest Editors*) (2015) – *Correlations of Quaternary Fluvial, Eolian, Deltaic and Marine Sequences: SEQS 2013*, Quaternary International, Volume **357**, Special Issue, Elsevier, 30 January 2015, ISSN 1040-6182, 344p. http://www.sciencedirect.com/science/journal/ 10406182/357 (accessed April 2015)

I.2. Papers, abstracts/extended abstracts, notes and reviews, published in scientific journals

Rădan, S., Panin, N., Rădan S.-C. (2015) – *SEQS 2013*: *Correlations of Quaternary fluvial, eolian, deltaic and marine sequences – Meeting and field trip in Romania*, Guest Editorial, Quaternary International, vol. **357**, p. 1-3. Elsevier Ltd. and INQUA. http://dx.doi.org/10.1016/j.quaint. 2014.12.034.

Rădan, S.-C., Rădan, S. (2011a)* – *Coal Palaeofires in the Western Dacic Basin: Geophysical, Mineralogical and Geochemical Signatures Recovered from Porcelanites and Clinkers; a Case History*, "FESP III – International Meeting on Fire Effects on Soils Properties", 3rd Edition, 15 – 19 March, 2011, University of Minho – Guimãraes, Portugal, Book of Abstracts, Abstract 2749.

Rădan, S.-C., Rădan, S. (2011b)* – *How coal fires affect the clays: An interdisciplinary approach*, "FESP III – International Meeting on Fire Effects on Soils Properties", 3rd Edition, 15 – 19 March, 2011, University of Minho – Guimãraes, Portugal, Book of Abstracts, Abstract 2750.

Rădan, S.-C., Rădan, S. (2011c)* – *How coal fires affect the clays: An interdisciplinary approach*, p. 148-152, in Gonçalves, A.B., and Vieira, A. (Eds.), *Fire Effects on Soil Properties*, Proceedings of the 3rd International Meeting of Fire Effects on Soil Properties, Guimarães, Portugal, 15 – 19 March, 2011. Edited by Núcleo de Investigação em Geografia e Planeamento (Universidade do Minho) and Centro de Estudos de Geografia e Ordenamento do Território (Universidades de Coimbra, Porto e Minho), ISBN 978-989-97214-0-1, 280 p.

Rădan, S.-C., Rădan, S. (2011d)* – *Coal Palaeofires in the Western Dacic Basin: Geophysical, Mineralogical and Geochemical Signatures Recovered from Porcelanites and Clinkers; a Case History*, p. 266-270, in Gonçalves, A.B. and Vieira, A. (Eds.), *Fire Effects on Soil Properties*, Proceedings of the 3rd International Meeting of Fire Efects on Soil Properties, Guimarães, Portugal, 15 – 19 March, 2011. Edited by Núcleo de Investigação em Geografia e Planeamento (Universidade do Minho) and Centro de Estudos de Geografia e Ordenamento do Território (Universidades de Coimbra, Porto e Minho), ISBN 978-989-97214-0-1, 280 p.

Rădan, S.-C., Rădan, S. (2011e) – *Recent sediments as enviromagnetic archives. A brief overview*, Geo-Eco-Marina, **17**, Bucureşti-Constanţa, 103-122 (with a double plate).

Rădan, S.-C., Rădan, S., Catianis, I. (2011a)* – *Magnetic susceptibility distribution in lake sediments inferred from short cores collected in the Danube Delta and Razim – Sinoie Lagoonal Complex*, DELTANET International Conference – "*DELTAS AND WETLANDS*", 14 – 16 September, 2011, Tulcea Romania, Programme and Abstracts, p. 18-19.

Rădan, S.-C., Rădan, S., Vărzaru, C. (2011b)* – *Magnetic Susceptibility Calibration and Lithological Characterisation of the Lake Sediments from the Black Sea Littoral Zone (Romania): Natural and Anthropogenic Inferences*, 3rd International Symposium on the Geology of the Black Sea Region, Bucharest, 1 – 10 October, 2011, ABSTRACTS, Supplement to Geo-Eco-Marina, **17**, 2011, p. 140-143.

Rădan, S.-C. (2012) – *Towards a synopsis of dating the loess from the Romanian Plain and Dobrogea: Authors and methods through time*, Geo-Eco-Marina, **18**, Bucureşti-Constanţa, Romania, p. 153-172.

Rădan, S.-C., Rădan, S. (2012) – *Magnetic susceptibility as a versatile investigation tool in different geocontexts: from Palaeozoic rocks to Recent sediments. An overview of three case studies*, p. 40-42, in Kido, E., Suttner, T.J., Piller, W.E., Da Silva, A.C., Corradini, C., Simonetto, L. (Eds.), Abstract Volume, IGCP 580: "*Magnetic Susceptibility and Gamma-Ray Spectrometry through time*", 4th Annual Meeting, 24 – 30th June 2012, Graz, Austria, Berichte des Institutes für Erdwissenschaften, Karl-Franzens-Universität Graz, Band **17**, ISSN 1608-8166, 108p.

Rădan, S.-C., Rădan, S., Catianis, I. (2012a)* – *Magnetic susceptibility distribution in lake sediments inferred from short cores collected in the Danube Delta and Razim – Sinoie Lagoonal Complex*, BALWOIS 2012 – 5th Conference on *Water, Climate and Environment*, 28 May – 2 June, 2012, Ohrid, Republic of Macedonia, Abstracts (accepted as Abstract 594). http://ocs.balwois.com/index.php?conference=BALWOIS&schedConf=BW2012&page=paper&op=view&path%5B%5D=594 (*accessed April 2015*).

Rădan, S.-C., Rădan, S., Catianis, I. (2012b)* – *Magnetic susceptibility distribution in lake sediments inferred from short cores collected in the Danube Delta and Razim – Sinoie Lagoonal Complex. I. Results from deltaic lakes*, p. 103-105, in Túnyi I., Petrovsky, E., Šoltis, T. (Eds.), "*Paleo, Rock and Environmental Magnetism*", Book of Abstracts, "13th Castle Meeting", June 17th – 23rd, 2012, Zvolen, Slovak Republic, Contributions to Geophysics and Geodesy, vol. **42**, Special issue, Geophys. Inst. Slovak Acad. Sci., Bratislava, Slovakia, 126p.

Rădan, S.-C., Rădan, S., Catianis, I. (2012c)* – *Magnetic susceptibility distribution in lake sediments inferred from short cores collected in the Danube Delta and Razim

– *Sinoie Lagoonal Complex. I. Results from deltaic lakes*, p. 43-45, in Kido, E., Suttner, T.J., Piller, W.E., Da Silva, A.C., Corradini, C., Simonetto, L. (Eds.), Abstract Volume, IGCP 580: "*Magnetic Susceptibility and Gamma-Ray Spectrometry through time*", 4th Annual Meeting, 24 – 30th June 2012, Graz, Austria, Berichte des Institutes für Erdwissenschaften, Karl-Franzens-Universität Graz, Band **17**, ISSN 1608-8166, 108p.

Rădan, S.-C., Rădan, S., Catianis, I. (2012d)* – *Magnetic susceptibility distribution in lake sediments inferred from short cores collected in the Danube Delta and Razim – Sinoie Lagoonal Complex. II. Results from the lagoonal complex*, International Conference "*Water Resources and Wetlands*", September 14–16, 2012, Tulcea, Romania, http://www.limnology.ro/water2012/abstract/D/D10.html (*accessed April 2015*).

Rădan, S.-C., Rădan, S., Vărzaru, C. (2012e)* – *Magnetic susceptibility calibration and lithological characterisation of the lake sediments from the Black Sea Littoral Zone (Romania): Natural and anthropogenic Inferences*, BALWOIS 2012 – 5th Conference on *Water, Climate and Environment*, 28 May – 2 June, 2012, Ohrid, Republic of Macedonia, Abstracts (accepted as Abstract 611). http://ocs.balwois.com/index.php?conference=BALWOIS&schedConf=BW%202012&page=paper&op=view&path%5B%5D=611 (*accessed April 2015*).

Rădan, S.-C., Rădan, S., Vărzaru, C. (2012f)* – *Magnetic susceptibility calibration and lithological characterisation of the lake sediments from the Black Sea Littoral Zone (Romania): Natural and anthropogenic inferences*, p. 106-107, in Túnyi, I., Petrovsky, E., Šoltis, T. (Eds.), "*Paleo, Rock and Environmental Magnetism*", Book of Abstracts, "13th Castle Meeting", June 17th – 23rd, 2012, Zvolen, Slovak Republic, Contributions to Geophysics and Geodesy, vol. **42**, Special issue, Geophys. Inst. Slovak Acad. Sci., Bratislava, Slovakia, 126p.

Rădan, S.-C., Rădan, S., Vărzaru, C. (2012g)* – *Magnetic susceptibility calibration and lithological characterization of the lake sediments from the Black Sea Littoral Zone (Romania): Natural and anthropogenic inferences*, International Conference "*Water Resources and Wetlands*", September 14 – 16, 2012, Tulcea, Romania, http://www.limnology.ro/water2012/abstract/D/D4.html (*accessed April 2015*).

Dimitriu R.G., Oaie G., Szobotka S.A., Rădan S.-C., Opreanu G., Dan S., Stănescu, I. (2013a)** – *Rapid changes of the seabed hydro-geomorphological features within the Sfântu Gheorghe – Vadu littoral zone* (*Romanian Black Sea coast*), Abstract, p. 95. In: Török, L. (Ed.) (2013) – *Deltas and Wetlands* (Book of abstracts), No. **1**, Chapter 6: The 17th Scientific Symposium "*DELTAS AND WETLANDS*" – 2008, Posters, ISSN 2344-3766, ISSN-L 2344-3766, ISBN-978-973-88117-5-1, NIRDEP – Danube Delta National Institute for Research and Development, Tulcea, 226p.

Dimitriu R.G., Oaie G., Gomoiu M.T., Begun T., Szobotka S.A., Rădan S.-C, Fulga C. (2013b)** – *The geoenvironmental status of the Razelm – Sinoie Lacustrine Complex at the beginning of the 21st century*, Abstract, p. 101-102. In: Török, L. (Ed.) (2013) – *Deltas and Wetlands* (Book of abstracts), No. **1**, Chapter 7: The 16th Scientific Symposium "*DELTAS AND WETLANDS*" – 2007, Oral Presentations, ISSN 2344-3766, ISSN-L 2344-3766, ISBN-978-973-88117-5-1, NIRDEP – Danube Delta National Institute for Research and Development, Tulcea, 226p.

Dimitriu R.G., Oaie G., Szobotka S.A., Sava C.S., Rădan S.-C., Fulga C. (2013c)** – *Hydro-geomorphological mapping of the Sfântu Gheorghe – Vadu littoral zone. Results of the integrated, geophysical geoenvironmental research carried out during 2005 – 2006*, Abstract, p. 102-103. In: Török, L. (Ed.) (2013) – *Deltas and Wetlands* (Book of abstracts), No. **1**, Chapter 7: The 16th Scientific Symposium "*DELTAS AND WETLANDS*" – 2007, Oral Presentations, ISSN 2344-3766, ISSN-L 2344-3766, ISBN – 978-973-88117-5-1, NIRDEP – Danube Delta National Institute for Research and Development, Tulcea, 226p.

Rădan, S.-C. (2013) – *Is the Romanian Loess Older than 0.8 Ma ? A Dating Overview and an Up-To-Date Reply Based on Magnetic Multy-Proxy Signatures Correlated to the Geomagnetic Polarity and Marine Isotope Stage Time Scales*, p. 31-32 (Abstract). In: Rădan, S., Rădan, S.C., Vasiliu, C. (Eds.) (2013) – *Correlations of Quaternary Fluvial, Eolian, Deltaic and Marine Sequences*, Book of Abstracts, 2013 Meeting of INQUA – Section on European Quaternary Stratigraphy (SEQS), 23rd – 27th September 2013, Constanţa (Romania), GeoEcoMar, Bucharest, ISBN 978-973-0-15477-1, 36p.

Rădan, S.-C., Rădan, S. (2013a)** – *Lake sediments fingerprinting in the Danube Delta, using composite magneto – lithological signatures; an environmental approach*, Abstract, p. 69-70. In: Török, L. (Ed.) (2013) – *Deltas and Wetlands* (Book of abstracts), No. **1**, Chapter 5: The 18th Scientific Symposium "*DELTAS AND WETLANDS*" – 2009, Posters, ISSN 2344-3766, ISSN-L 2344-3766, ISBN – 978-973-88117-5-1, NIRDEP – Danube Delta National Institute for Research and Development, Tulcea, 226p.

Rădan, S.-C., Rădan, S. (2013b)** – *Modern sediments as enviromagnetic archives. A case study: Danube Delta and northwestern Black Sea, Abstract*, p. 88. In: Török, L. (Ed.) (2013) – *Deltas and Wetlands* (Book of abstracts), No. **1**, Chapter 6: The 17th Scientific Symposium "*DELTAS AND WETLANDS*" – 2008, Posters, ISSN 2344-3766, ISSN-L 2344- 3766, ISBN – 978-973-88117-5-1, NIRDEP – Danube Delta National Institute for Research and Development, Tulcea, 226p.

Rădan, S.-C., Rădan, S. (2013c)** – *The magnetic signature of present environmental changes in lake sediments induced by hydrotechnical work; a case study from the Danube Delta (Romania)*, Abstract, p. 112. In: Török, L. (Ed.) (2013) – *Deltas and Wetlands* (Book of abstracts), No. **1**, Chapter 7: The 16th Scientific Symposium "*DELTAS AND WETLANDS*" – 2007, Posters, ISSN 2344-3766, ISSN-L 2344-3766, ISBN – 978-973-88117-5-1, NIRDEP – Danube Delta National Institute for Research and Development, Tulcea, 226p.

Rădan, S.-C., Rădan, S. (2013d)** – *A magnetic susceptibility scale with a lithological support originated in the lake sediments from the Danube Delta and the Razim – Sinoie Lagoonal Complex (Romania). An environmental and geoecological approach*, Abstract, p. 128. In: Török, L. (Ed.) (2013) – *Deltas and Wetlands* (Book of abstracts), No. **1**, Chapter 8: The 15th Scientific Symposium "*DELTAS AND WETLANDS*" – 2006, Posters, ISSN 2344-3766, ISSN-L 2344-3766, ISBN – 978-973-88117-5-1, NIRDEP – Danube Delta National Institute for Research and Development, Tulcea, 226p.

Rădan, S.-C., Rădan, S. (2013e)** – *Enviromagnetic fingerprints of the natural changes and anthropogenic pressure on Danube Delta ecosystems recovered from bottom* *sediments*, Abstract, 146. In: Török, L. (Ed.) (2013) – *Deltas and Wetlands* (Book of abstracts), No. **1**, Chapter 9: The 14th Scientific Symposium "*DELTAS AND WETLANDS*" – 2005, Posters, ISSN 2344-3766, ISSN-L 2344-3766, ISBN – 978-973-88117-5-1, NIRDEP – Danube Delta National Institute for Research and Development, Tulcea, 226p.

Rădan, S.-C., Rădan, S., Catianis, I. (2013a) – *The use of the magnetic susceptibility record as a proxy signature for the lithological composition of lake sediments: Evidences from Danube Delta short cores in the Meşteru – Fortuna Depression (Danube Delta),* Geo-Eco-Marina, **19**, Bucureşti - Constanţa, Romania, ISSN: 2248–2776, ISSN-L: 1224–6808, p. 77-105.

Rădan, S.-C., Rădan, S., Catianis I. (2013b) – *A magneto-lithological approach of the recent sediments from the Danube Delta, focused on some more or less connected pairs of lakes; environmental inferences*, Abstract, p. 17. In: Török, L. (Ed.) (2013) – *Deltas and Wetlands* (Book of abstracts), No. **1**, Chapter 1: The 22nd Scientific Symposium "*DELTAS AND WETLANDS*" – 2013, Posters, ISSN 2344-3766, ISSN-L 2344-3766, ISBN – 978-973-88117-5-1, NIRDEP – Danube Delta National Institute for Research and Development, Tulcea, 226p.

Rădan, S.-C., Rădan, S., Catianis I. (2013c)** – *Magnetic susceptibility distribution in lake sediments inferred from short cores collected in the Danube Delta and Razim - Sinoie Lagoonal Complex,* Abstract, p. 34. In: Török, L. (Ed.) (2013) – *Deltas and Wetlands* (Book of abstracts), No. **1**, Chapter 3: The 20th Scientific Symposium "*DELTAS AND WETLANDS*" – 2011, Posters, ISSN 2344-3766, ISSN-L 2344-3766, ISBN – 978-973-88117-5-1, NIRDEP – Danube Delta National Institute for Research and Development, Tulcea, 226p.

Rădan, S.-C., Rădan, S., Cazacu C. (2013d)** – *Parallel magnetic susceptibility calibration and lithological classification of the lake sediments from the Black Sea littoral zone (Romania): natural and anthropogenic inferences*, Abstract, p. 50. In: Török, L. (Ed.) (2013) – *Deltas and Wetlands* (Book of abstracts), No. **1**, Chapter 4: The 19th Scientific Symposium "*DELTAS AND WETLANDS*" – 2010, Posters, ISSN 2344-3766, ISSN-L 2344-3766, ISBN – 978-973-88117-5-1, NIRDEP – Danube Delta National Institute for Research and Development, Tulcea, 226p.

Rădan, S.-C., Rădan, S., Cazacu C., Milu C. (2013e)** – *Magneto-lithological models for recent sediments: examples from deltaic, lagoonal and littoral lakes*, Abstract, p. 86-87. In: Török, L. (Ed.) (2013) – *Deltas and Wetlands* (Book of abstracts), No. **1**, Chapter 6: The 17th Scientific Symposium "*DELTAS AND WETLANDS*" – 2008, Posters, ISSN 2344-3766, ISSN-L 2344-3766, ISBN – 978-973-88117-5-1, NIRDEP – Danube Delta National Institute for Research and Development, Tulcea, 226p.

Rădan, S.-C., Rădan, S., Cazacu C., Milu C. (2013f)** – *Magnetic susceptibility and lithological characterisation of the lake sediments from the southeastern Romania wetlands; environmental significances*, Abstract, p. 87-88. In: Török, L. (Ed.) (2013) – *Deltas and Wetlands* (Book of abstracts), No. **1**, Chapter 6: The 17th Scientific Symposium "*DELTAS AND WETLANDS*" – 2008, Posters, ISSN 2344-3766, ISSN-L 2344-3766, ISBN – 978-973- 88117-5-1, NIRDEP – Danube Delta National Institute for Research and Development, Tulcea, 226p.

Rădan, S.-C. (2014a) – *Magnetism of Cretaceous Bauxites from Pădurea Craiului (Apuseni Mountains, Romania): Implications for Near-Surface Lens Exploration*, Abstract, p. 41-42. In: Kido, E., Waters, J.A., Ariunchimeg, Ya., Gonchigdori, S., Da Silva, A.C., Whalen, M., Suttner , T.J. & Königshof, P. (Eds.), Abstract Volume, 2014 IGCP 596 & 580, Joint Meeting Mongolia, Ulaanbaatar, 5-18th August, 2014, Berichte des Institutes für Erdwissenschaften, Karl-Franzens-Universität Graz, Band **19**, ISSN 1608-8166, Graz, 65p.

Rădan, S.-C. (2014b) – *A Magnetic Multi-proxy Approach of the Loess-Palaeosoil Sequences in Southern Romania, in a Chronostratigraphic – Palaeoenvironmental – Palaeoclimatic Context: An Overview and New Results*, Abstract, p. 43-45. In: Kido, E., Waters, J.A., Ariunchimeg, Ya., Gonchigdori, S., Da Silva, A.C., Whalen, M., Suttner, T.J. & Königshof, P. (Eds.), Abstract Volume, 2014 IGCP 596 & 580, Joint Meeting Mongolia, Ulaanbaatar, 5-18th August, 2014, Berichte des Institutes für Erdwissenschaften, Karl-Franzens-Universität Graz, Band **19**, ISSN 1608-8166, Graz, 65p.

Rădan, S.-C. (2014c) – *A tentative synopsis of dating the loess in Southern Romania over the last half-century. New results and older ages*, 14th Castle Meeting: "*New Trends on Paleo, Rock and Environmental Magnetism*", 31st August – 6th September 2014, Évora, Portugal, https://www.fc.ul.pt/sites/default/files/fcul/public/14Castle_meeting/Radan2_Castle%20Meeting_Portugal_Abstract_Paper%202_Loess_S%20C%20Radan_Romania.pdf.

Rădan, S.-C., Rădan, S. (2014) – *The geomagnetic recording medium from western Dacic Basin (Romania) disturbed by coal palaeo-fires: Pleistocene porcellanites within Pliocene lignite - clay sequences; multi-proxy evidence*, p.124-126, p.202 (Appendix 9/Fig. A10). In: Borodin, A.V., Markova, E.A., Strukova, T.V. (Eds.) – "*The Quaternary of the Urals: Global trends and Pan-European Quaternary records*", Proceedings of the International conference INQUA-SEQS 2014, Ekaterinburg, Russia, September 10 – 16, 2014, Ekaterinburg, UrFU, 2014, ISBN 978-5-321-02398-3, 228p.

Rădan, S.-C., Rădan, S., Catianis, I. (2014a) – *Relationship between the magnetic susceptibility and lithological composition in sediment cores from lakes of Matiţa – Merhei Depression (Danube Delta, Romania): Towards a proxy method of sedimentological and environmental fingerprinting*, Geo-Eco-Marina, **20**, Bucureşti - Constanţa, ISSN: 2248–2776. ISSN-L: 1224–6808, p. 45-86.

Rădan, S.-C., Rădan, S**.**, Catianis, I., Scrieciu, A. (2014b) – *Composite enviromagnetic and lithological signatures retrieved from recent sediments in the Danube Delta (Romania), with a special view to the couples of lakes*, 14th Castle Meeting: "*New Trends on Paleo, Rock and Environmental Magnetism*", 31st August – 6th September 2014, Évora, Portugal. https://www.fc.ul.pt/sites/default/files/fcul/public/14Castle_meeting/Radan1_Castle%20Meeting_Portugal_Abstract-Paper%201_Danube-Delta_Radan-et-al_ Romania.pdf.

Rădan, S.-C.,_Rădan, S., Catianis, I., Scrieciu, A. (2014c) – *Towards assessing the potential for stratigraphic studies in the Danube Delta geo-environments by using magnetosusceptibility and lithological records retrieved from Recent sediments*, p. 127-128, p. 203 (Appendix 10/Fig. A11). In: Borodin, A.V., Markova, E.A., Strukova, T.V. (Eds.) – "*The Quaternary of the Urals: Global trends and Pan-European Quaternary records*", Proceedings of the International conference

INQUA-SEQS 2014, Ekaterinburg, Russia, September 10 – 16, 2014, Ekaterinburg, UrFU, 2014, ISBN 978-5-321-02398-3, 228p.

Rădan, S.-C., Rădan, S., Catianis, I., Scrieciu, A. (2014d) – *Magnetosusceptibility and lithological fingerprints of the marine clays recovered from sediment cores taken in the Danube Delta* (*Romania*), p. 30. In: Török, L. (Ed.) – "*Deltas and Wetlands*" (Book of abstracts), vol. 2, 48p., Danube Delta Tehnological Information Center Publishing House, Tulcea, Romania, ISSN 2344-3766; DOI: 10.14592/DDI.D.W.02.2014.

Rădan, S., Panin, N., Rădan S.C. (2015) – *SEQS 2013: Correlations of Quaternary fluvial, eolian, deltaic and marine sequences – Meeting and field trip in Romania*, Guest Editorial, Quaternary International, Elsevier, Vol. **357**, p. 1-3. http://www.sciencedirect.com/science/article/pii/ S1040618214009896 (*accessed April 2015*).

Rădan, S.-C. (2015) – *Fingerprints of personality and writings of Professor Liviu Constantinescu in the theses of his PhD students: A tribute at 100 years since his birth*, Geo-Eco-Marina, **21**, Bucureşti - Constanţa (*in press*).

Rădan, S.-C., Rădan, S. (2015) – (*Palaeo*)*geomagnetic and (thermo)mineralogical data from Dacic Basin (Romania), showing changes in the timing and magnitude of coal palaeofire activity consequences*, XIX INQUA Congress – "*Quaternary Perspectives on Climate Change, Natural Hazards and Civilization*", Nagoya, Japan, 26 July – 2 August 2015 (Abstract Entry No. T02604; paper accepted for presentation in the Congress, according to the Notification of Abstract Acceptance T02604 of 10 February 2015). http://inqua2015.jp/info/Accepted_ Abstracts.pdf. (*accessed April 2015*).

Rădan, S.-C., Rădan, S., Catianis, I. (2015a) – *Towards a proxy method of minerogenic and environmental fingerprinting in lake sediments, inferred from magneto-lithological records in Danube Delta* (*Romania*), XIX INQUA Congress – "*Quaternary Perspectives on Climate Change, Natural Hazards and Civilization*", Nagoya, Japan, 26 July – 2 August 2015 (Abstract Entry No. T02597; paper accepted for presentation in the Congress, according to the Notification of Abstract Acceptance T02597 of 10 February 2015). http://inqua2015.jp/ info/Accepted_Abstracts.pdf. (*accessed April 2015*)

Rădan, S.-C., Rădan, S., Scrieciu, I. (2015b) – *Environmental influences on the magnetic susceptibility of recent sediments in Danube Delta, in geoecological context: insights from lakes of Gorgova - Uzlina Depression*, 24th Symposium "*Deltas and Wetlands*", 19 – 21 May 2015, Tulcea, Romania (paper accepted for presentation, according to AGENDA of Symposium; http://www.ddni.ro/ manager/editor/UserFiles/File/Simpozioane/Simp2015/Agenda_Deltas& Wetlands_2015.pdf) (*accessed April 2015*).

.Rădan, S.C., Rădan, S., Catianis, I., Scrieciu, I. (2015c) – *A Comparison of Magnetosusceptibility, Minerogenetic and Organic Matter Records in the Lake Sediments of Matita − Merhei Depression (Danube Delta, Romania): Sedimentological and Environmental Inferences*, 24th Symposium "*Deltas and Wetlands*", 19 – 21 May 2015, Tulcea, Romania (paper accepted for presentation, according to AGENDA of Symposium; http://www.ddni.ro/manager/editor/ UserFiles/File/Simpozioane/Simp2015/Agenda_Deltas&Wetlands_2015.pdf) (*accessed April 2015*).

Notes:

* abstracts with identical titles (in some cases, with additional text and/or figures), published in different volumes of abstracts or in journals, distributed at more than one scientific meeting, where the papers were accepted for presentation;

** abstracts which have firstly appeared in *sets of abstracts* (without ISBN or ISSN), associated with the respective Symposia "*DELTAS AND WETLANDS*" (Tulcea, 2005-2013), and which were published, in 2013, in the "Book of Abstracts" - vol. **2** (editor: L. Török), with a given ISSN, ISSN-L, and ISBN (see **Ch. I.2**).

I.3. Chapters related to the activities of the IAGA (International Association of Geomagnetism and Aeronomy) Section, within the National Report concerning the Geodetic and Geophysical Activities in Romania (2007 – 2011), carried out for the General Assembly of the International Union of Geodesy and Geophysics/IUGG, held in Australia – 2011

Rădan, S.-C. (2011) – ”*Report of the Romanian IAGA Section*” – *Working Group I.3, Working Group I.4* – “*Palaeomagnetic, Rock Magnetic and Enviromagnetic Studies in the Geological Institute of Romania* (*G.I.R.*), *in the 2007 – 2011 period*”, p. 19-40, in “*National Report on Geodetic and Geophysical Activities in Romania* (*2007 – 2011*)” (Sava, C. – volume coordinator; Bojariu, R., Burcea S., Cucu, G., Demetrescu, C., Duţu, F., Enescu, D., Pandele, A., Rădan, S.C., Rus, T., Stăncălie, Gh., Stănică, D., Szakacs, A., Ştefan, S., and Tudose, E. – editors), XXVth International Union of Geodesy and Geophysics General Assembly, ”*Earth on the Edge: Science for a Sustainable Planet*”, Melbourne, Australia, 28 June - 7 July. Published by the Romanian Academy – Romanian National Committee of Geodesy and Geophysics, Bucharest, 2011, 274 p. CD distributed at the XXVth IUGG General Assembly, Melbourne, Australia, 28 June – 7 July, 2011. Also, on website: http://iag.dgfi.badw.de/fileadmin/IAG-docs/NationalReports2011/Romania.pdf (*accessed April 2015*).

II. Papers presented at International Symposia, Conferences/Meetings – International Projects

Rădan, S.-C., Rădan, S., Catianis, I. (2011a) – *Magnetic susceptibility distribution in lake sediments inferred from short cores collected in the Danube Delta and Razim – Sinoie Lagoonal Complex*, DELTANET International Conference – “*DELTAS AND WETLANDS*”, 14 – 16 September, 2011, Tulcea, Romania.

- *Note*: Poster Presentation

Rădan, S.-C., Rădan, S., Vărzaru, C. (2011b)* – *Magnetic Susceptibility Calibration and Lithological Characterisation of the Lake Sediments from the Black Sea Littoral Zone (Romania): Natural and Anthropogenic Inferences*, 3rd International Symposium on the Geology of the Black Sea Region, 1 – 10 October, 2011, Bucharest, Romania.

- *Note*: Poster Presentation

Rădan, S.-C., Rădan, S. (2012) – *Magnetic susceptibility as a versatile investigation tool in different geocontexts: from Palaeozoic rocks to Recent sediments. An overview*

of three case studies, IGCP 580 4th Annual Meeting: "*Magnetic Susceptibility and Gamma-Ray Spectrometry through time*", 24th – 30th June 2012, Graz, Austria.

• *Note*: Oral Presentation

Rădan, S.C., Rădan, S., Catianis, I. (2012a)* – *Magnetic susceptibility distribution in lake sediments inferred from short cores collected in the Danube Delta and Razim – Sinoie Lagoonal Complex. I. Results from deltaic lakes*, 13th Castle Meeting. "*Paleo, Rock and Environmental Magnetism*", June 17th – 23rd, 2012, Zvolen, Slovak Republic.

• *Note*: Poster Presentation with an Oral Introduction (ppt)

Rădan, S.-C., Rădan, S., Catianis, I. (2012b)* – *Magnetic susceptibility distribution in lake sediments inferred from short cores collected in the Danube Delta and Razim – Sinoie Lagoonal Complex. I. Results from deltaic lakes*, IGCP 580 4th Annual Meeting: "*Magnetic Susceptibility and Gamma-Ray Spectrometry through time*", 24th – 30th June 2012, Graz, Austria.

• *Note*: Oral Presentation

Rădan, S.-C., Rădan, S., Vărzaru, C. (2012c)* – *Magnetic susceptibility calibration and lithological characterisation of the lake sediments from the Black Sea Littoral Zone (Romania): Natural and anthropogenic inference*s, 13th Castle Meeting: "*Paleo, Rock and Environmental Magnetism*", June 17th – 23rd, 2012, Zvolen, Slovak Republic.

• *Note*: Poster Presentation with an Oral Introduction (ppt)

Rădan, S.-C. (2013) – *Is the Romanian Loess Older than 0.8 Ma ? A Dating Overview and an Up-To-Date Reply Based on Magnetic Multy-Proxy Signatures Correlated to the Geomagnetic Polarity and Marine Isotope Stage Time Scales*, 2013 Meeting of INQUA – Section on European Quaternary Stratigraphy (SEQS): "*Correlations of Quaternary Fluvial, Eolian, Deltaic and Marine Sequences*", 23rd – 27th September 2013, Constanţa (Romania).

• *Note*: Oral Presentation (invited); member in the Scientific Committee for 2013 Meeting of INQUA-SEQS (Constanţa, Romania).

. Rădan, S.-C. (2014) – *A Magnetic Multi-proxy Approach of the Loess-Palaeosoil Sequences in Southern Romania, in a Chronostratigraphic – Palaeoenvironmental – Palaeoclimatic Context: An Overview and New Results*, 2014 IGCP 596 & 580, Joint Meeting Mongolia, Ulaanbaatar, 5th – 18th August, 2014. http://www2.ulg.ac.be/geolsed/MS/14%20-%20Kido%20et%20al%20 abstract.pdf (accessed April 2015).

• *Note*: Poster Presentation – due to the kindness of Dr. Thomas Suttner, from Karl-Franzens-Universität Graz, Austria, who participated at the IGCP 596 & 580 Conference, held at Ulaanbaatar, Mongolia, during 5th – 18th August, 2014, and also presented the above cited paper (with a published abstract – see Rădan, S.-C. (2014c): **R.-I.2**).

Rădan S.-C., Rădan, S., Catianis, I., Scrieciu, A. (2014) – *Magnetosusceptibility and lithological fingerprints of the marine clays recovered from sediment cores taken in the Danube Delta (Romania),* BSB Net-Eco International Conference "*Environmental aspects and available scientific tools for Black Sea Basin protection*", Tulcea, 15 – 17 September, 2014.

• *Note*: Poster Presentation.

III. Citations, in:

- Papers (ISI indexed, included)/Books of Romanian and/or foreign authors, published in Romania or abroad;
- "***International Databases***", *e.g*.:

  ✓*GeoRef* (American Geosciences Institute) http://www.americangeosciences.org/georef/georef-information-services
  ✓ *ScienceDirect* http://www.sciencedirect.com
  ✓ *EBSCOhost* http://connection.ebscohost.com/c/articles/90543817
  ✓ *Wildland Fire, Wildland Fire, June 2013. A free monthly electronic publication, Fire Research Institute, San Antonio, Texas 78247 USA* http://www.fireresearchinstitute.org
  ✓ *Digitale Literature – Oberostereichisches Landesmuseum*. http://www.landesmuseum.at/datenbanken/digilit
  ✓ *eBookily.org* www.ebookily.org
  ✓ *E-books pdf. Org* http://www.e-bookspdf.org
  etc.

- "***Libraries of Universities***", *e.g*.:

  ✓ MacEwan University Library (Canada) https://library.macewan.ca
  ✓ *Forschungsportal Forschungsportal, Universität für Bodencultur Vien, University of Natural Resources and Life Sciences, Vienna (BOKU)*; https://forschung.boku.ac.at/fis/suchen.publikationen_uni_autoren?sprache_in=en&menue_id_in=400&id_in=&publikation_ id_in=91006
  ✓ *Latvijas Universitātes Bibliotēka*, *Latvijas Universitātes Facultātes, Ģeogrāfijas un Zemes zinātņu fakultāte http://www.biblioteka.lu.lv/par-biblioteku/izstades/virtualas-izstades/fakultates/gzzf*
  etc.

Among the **cited** books/papers/abstracts (edited/published during the period under attention, *i.e*., 2011 – 2015), in other scientific publications and/or mentioned within some databases, are: Rădan, S. *et al*. (2013a, 2015 – in process of editing and indexing in *GeoRef*; **R.-Ch. I.1**), Rădan, S.C. (2012; **R.-Ch. I.2**), Rădan, S.C & Rădan, S. (2011c,d,e, 2012; **R.-Ch. I.2**); Rădan, S.C. *et al*. (2012c, 2013a; **R.-Ch. I.2**). Certainly, the list is incomplete. On the other hand, within this time interval (2011 – 2015), a series of papers/abstracts published before this period were inserted in important international databases: *e.g*. ***GeoRef*** (*American Geosciences Institute*), in 2012.

Division IV: Solar Wind and Interplanetary Field

In the last years, the space climate/space weather research direction has continued its development at the Institute of Geodynamics of the Romanian Academy, in close relation with programmes of the International Heliophysical Year, COST Action ES0803 “Developing space weather products and services in Europe”, and COST Action ES1005 ”Towards a more complete assessment of the impact of solar variability on the Earth's climate” (TOSCA). The space weather regards the short-term variations in the different forms of solar activity, their prediction and effects on the near-Earth environment and technology. The space climate concept refers to long-term change in the Sun, and its effects in the heliosphere and upon the Earth, including the atmosphere and climate.

These studies have been focused on the following research lines:

- CME reconstruction and modelling;
- CME geoeffectivity;
- HSS determination. Analysis of the solar wind impact on geomagnetic activity;
- Analysis of long-term (decadal, inter-decadal and centennial) solar and geomagnetic activities;
- Solar/geomagnetic forcing on terrestrial climate.

1. 3D CME reconstruction and modelling

CMEs are powerful solar eruptive phenomena that can influence our lives. Our group has concentrated its study toward understanding how CMEs can or will have an impact on the terrestrial magnetosphere.

In recent years, after the launch of the STERO mission, a mission composed of two identical satellites, the 3D imaging of the Sun has greatly evolved. We used this opportunity to create a technique such that we can reconstruct the structure of the CME (Mierla et al., 2011; Orlando et al., 2011; Chifu et al., 2012; Zucarello et al., 2012; Besliu-Ionescu et al., 2012-2013; Feng et al., 2013).

We have also used the flux-rope model proposed by Thernisien, Howard and Vourlidas (Astrophysical Journal, 652, 2006) to study the 3D CME structure propagation in time.

Published papers

Mierla, M., Inhester, B., Rodriguez, L., Gissot, S., Zhukov, A., and Srivastava, N., 2011, On 3D reconstruction of coronal mass ejections: II. Longitudinal and latitudinal width analysis of 31 August 2007 event, *J. Atm. Solar-Terr. Phys*., 73, 1166-1172, DOI: 10.1016/j.jastp.2010.11.028.

Orlando, A., Zuccarello, F., Romano, P., Zuccarello, F. P., Mierla, M., Spadaro, D., and Ventura, R., 2011, CME evolution and 3D reconstruction with STEREO Data, *Advances in Plasma Astrophysics*, *Proc. of the International Astronomical Union, IAU Symp.*, 274, 165-167, DOI: 10.1017/S1743921311006831.

Chifu, I., Inhester, B., Mierla, M., Chifu, V., Wiegelmann, T., 2012, First 4D reconstruction of an eruptive prominence using simultaneously three view directions, *Solar Physics*, Online first, DOI: 10.1007/s11207-012-0107-5.

Zuccarello, F. P., Bemporad, A., Jacobs, C., Mierla, M., Poedts, S., Zuccarello, F., 2012, The role of streamers in the deflection of coronal mass ejections: Comparison between STEREO three-dimensional reconstructions and numerical simulations,

The Astrophysical Journal, 744, article id. 66, DOI: 10.1088/0004-637X/744/1/66.
Beşliu-Ionescu, D., Mariş Muntean, G., Lăcătuș, D.A., Paraschiv, A.R., Mierla, M., 2012-2013, Detailed analysis of a geoeffective ICME triggered by the March 15, 2013 CME, *Romanian Geophysical Journal,* 56-57, 41-49.
Feng, L., Inhester, B., Mierla, M., 2013, Comparisons of CME morphological characteristics derived from five 3D reconstruction methods, *Solar Physics*, 282, 221-238.

Conferences

Mierla, M., Feng, L., Rodriguez, L., Chifu, I., Inhester, B., 3D reconstruction of coronal mass ejections: where are we?, in *Solar Information processing workshop VI, Bozeman, U. S. A., 13-16 August 2012, (invited).*
Mierla, M., Dima, G., Moise, E., Rodriguez, L., Seaton, D., 3D reconstruction of a sigmoidal active region, *Sixth Coronal Loops workshop, La Roche, Belgium, 25-27 June 2013.*

2. The interplanetary manifestation of CMEs: ICMEs, their properties and geoeffectivity

Our studies have also been focusing on following the CMEs through the interplanetary space. We conducted extensive surveys of the properties for the geoeffective CMEs from solar cycle 23 and the first four years of the cycle 24. It was found that there was no obvious correlation between a certain CME characteristic and the occurrence of the geomagnetic storms.

Publications

Chiricuta, O., I. Chifu, D. Besliu-Ionescu, M. Mierla, 2011, Studies of Solar-Terrestrial connections: geomagnetic storms induced by coronal mass ejections", *Romanian Astronomical Journal,* 21, 123-126.
Mierla, M., Besliu-Ionescu, D., Chiricuta, O., Oprea, C., Maris, G., 2012, Studies of coronal mass ejections that have produced major geomagnetic storms, *Sun and Geosphere*, 7, 2-15.
Oprea, C., Mierla, M., Maris, G., 2012, Earth–directed coronal mass ejections and their geoeffectiveness during the 2007 – 2010 interval, *Proceedings of IAU Symposium 286 – Comparative Magnetic Minima: Characterizing Quiet Times in the Sun and Stars",* IAU Publisher: Cambridge University Press, 286, 242-245.
Oprea, C., Mierla, M., Beşliu-Ionescu, D., Stere, O., Mariş Muntean, G., 2013, A study of solar and interplanetary parameters of CMEs causing major geomagnetic storms during SC 23, *Annales Geophysicae*, 31, 1285-1295.
Beşliu-Ionescu, D., Mariş Muntean, G., Lăcătuș, D.A., Paraschiv, A.R., Mierla, M., 2012-2013, Detailed Analysis of a geoeffective ICME triggered by the March 15, 2013 CME, *Romanian Geophysical Journal*, 56-57, 41-49.

Conferences

Chiricuta, O., Chifu I., Mierla M., Maris G., Study of Earth-directed Halo Coronal Mass Ejections observed between 1996 and 2008, *Workshop on Assessment and Validation of Space Weather Models (COST Action ES0803 Management Committee), Alcala de Henares, Madrid, Spain, 14 – 18 March, 2011*.

Besliu-Ionescu, D., Chiricuta, O., Mierla, M., Maris, G., Study of Halloween 2003 events, *EGU 2011 General Assembly, Vienna, Austria, 3-8 April 2011*.

Chiricuta, O., Besliu-Ionescu, D., Mierla, M., Maris, G., Analysis of coronal mass ejections that produced major geomagnetic storms during the period 1998-2008, *EGU 2011 General Assembly, Vienna, Austria, 3-8 April 2011*.

Mierla, M., Besliu-Ionescu, D., Chiricuta, O., Oprea, C., Maris, G., Dobrica, V., Demetrescu, C., Studies of coronal mass ejections that have produced major geomagnetic storms, *The 3rd workshop "Solar influences on the ionosphere and magnetosphere", Sozopol, Bulgaria, June 6-10, 2011*.

Maris, G., Maris, O., Sources and complexity of the intense and severe geomagnetic storms during the maximum phase of solar cycle 23, *3rd Workshop Solar influences on the ionosphere and magnetosphere, Sozopol, Bulgaria, June 6-10, 2011*.

Oprea, C., Mierla, M., Maris, G., Earth-directed coronal cass Ejections and their geoeffectiveness during the 2007 – 2010 interval, *International Astronomical Union Symposium 286 – Comparative Magnetic Minima: Characterizing Quiet Times in the Sun and Stars", Mendoza, Argentina 3 – 7 October 2011*.

Maris, G., Maris, O., Mierla, M., Oprea, C., Stere, O., Sources and complexity of the geomagnetic super-storms during the maximum phase of solar cycle 23, *Workshop on "Final results of the COST Action ES0803", Prague, 13-14 March 2012*.

Mierla, M., Oprea, C., Srivastava, N., Rodriguez, L., Besliu-Ionescu, D., Stere, O., Maris Muntean, G., Empirical model for predicting the occurrence of major geomagnetic storms during sc23, *International Conference on Solar and Heliospheric Influences on the Geospace, Bucharest, Romania, 1-5 October 2012*.

Oprea, C., Study of solar parameters causing major geomagnetic storms during SC23, *International Conference on Solar and Heliospheric Influences on the Geospace, Bucharest, Romania, 1-5 October 2012*.

Stere, O., The study of CME travel time to Earth, *International Conference on Solar and Heliospheric Influences on the Geospace, Bucharest, Romania, 1-5 October 2012*.

Besliu-Ionescu, D., Maris, G., Mierla, M., Progress in understanding the complex solar event of September 13, 2005, *9th European Space Weather Week, Brussels, Belgium, 5-9 November 2012*.

Stere, O., Mierlă, M., Oprea, C., Maris, G., Beşliu-Ionescu, D., Study of geoeffective CMEs kinematics during the solar cycle 23, *9th European Space Weather Week, Brussels, Belgium, 5-9 November 2012*.

Besliu-Ionescu, D., Mierla, M., Srivastava, N., Maris Muntean, G., Linking various signatures of the February 15, 2011 solar flare, *Space Climate 5 – Under the midnight Sun, Oulu, Finland, 15-19 June 2013*.

Mierla, M., Rodriguez, L., Kilpua, E., D'Huys, E., Zuccarello, F., Zhukov, A., Seaton, D., Study of stealth CMEs arriving at the Earth in the period 2009 – 2010, *Tenth European Space Weather Week, Antwerp, Belgium, November 18-22, 2013*.

Besliu-Ionescu, D., Lacatus, D. A., Paraschiv, A. R., Mierla, M., Geoeffective CMEs associated with seismically active flares, *European Geosciences Union General Assembly, Vienna, Austria, 27 April – 02 May 2014*.

3. HSS: determination and geoeffectiveness

Our group has continued the studies about the characteristics of high speed streams (HSS). The HSS catalogue for the solar cycle 23, published by Maris and Maris (Highlights of Astronomy, J.F. Corbett ed., Cambridge Univ. Press., 2010) has been completed for the first three years of the solar cycle 24 (2009-2011) and is being updated every 2-3 months; it is available on the Institute of Geodynamics official web-page (www.geodin.ro). We also analysed HSSs geoeffectiveness (Maris et al., 2012) and compared their impact on the geomagnetic field considering the different solar sources (coronal holes, CMEs) that produced these streams. The systematic study for the HSSs in the solar cycle 23 concluded that HSSs emitted in coronal holes (CHs) located in the eastern solar hemisphere do not disturb the magnetosphere, while the location of CH close to the central meridian ± 10° ensures a geoeffectivity of about 60% and the CHs in the western hemisphere produce HSSs with an increased geoeffectivity up to 98%.

Publications

Maris, G., Maris, O., Oprea, C., Mierla, M., 2012, High Speed Streams in the solar wind, *Proceedings of IAU Symposium 286 – Comparative Magnetic Minima: Characterizing Quiet Times in the Sun and Stars*, IAU Publisher: Cambridge University Press, 286, 229-233, 07/2012, DOI: 10.1017/S1743921312004887.

Conferences

Maris, G., Maris, O., Oprea, C., Mierla, M., High-Speed Streams in the solar wind during the last solar minimum, *International Astronomical Union Symposium 286 – Comparative Magnetic Minima: Characterizing Quiet Times in the Sun and Stars, Mendoza, Argentina 3 – 7 October 2011.*

Maris, G., Mierla, M., Oprea, C., Stere, O., Georgieva, K., Kirov, B., Specific features of the high-speed streams in the solar wind and geomagnetic storms during the last prolonged solar minimum, *International Conference on Solar and Heliospheric Influences on the Geospace, Bucharest, Romania, 1-5 October 2012.*

Maris Muntean, G., Maris, O., Besliu-Ionescu, D., Mierla, M., Long-term variability of the high speed solar wind, *The Fifth Workshop Solar Influences on the Magnetosphere, Ionosphere and Atmosphere, Nesebar, Bulgaria, 3-7 June 2013*

Maris Muntean, G., Besliu-Ionescu, D., Mierla, M., Comparison of the high-speed solar wind streams during the first four years of last five solar cycles (nos. 20 – 24), *Tenth European Space Weather Week, Antwerp, Belgium, November 18-22, 2013*

4. Analysis of long-term solar and geomagnetic activity

The geomagnetic response to solar and interplanetary disturbance has been a constant subject of the studies carried out within the frame of the Institute of Geodynamics of the Romanian Academy. As a result of the interaction of the main geomagnetic field with the solar wind and the interplanetary (heliospheric) magnetic field, the so-called geomagnetic variations (also known as 'geomagnetic activity') are produced. They are described by means of geomagnetic indices, designed to represent effects of various current systems that form in the magnetosphere, ionosphere and the polar caps: e. g., Dst for the magnetospheric ring current; AE, AL, AU for the auroral electrojets; PC for the merging electric field in the solar wind and polar cap currents; aa, Ap for the mid-latitude geomagnetic activity. The subject has been approached through the study of long-term variability of the heliospheric and magnetospheric environments at the timescales of the magnetic Hale (22 years) and secular Gleissberg (80-90 years) cycles of solar activity, based on solar, heliospheric, and geomagnetic parameters measured and/or reconstructed (see below, under ‚Conferences'). The main conclusions at a certain stage were included in a review paper by Saiz et al. (2013) that we co-authored. Sources of the geomagnetic activity at mid-latitudes were explored for the case of the European network of geomagnetic observatories (Greculeasa et al., 2013). The variability of the magnetosphere dimensions, determined through the equilibrium relationship between the solar wind dynamic pressure (Pw) and the geomagnetic field one, has also been inferred. For the last 150 years Dobrica et al. (2012) reconstructed values of Pw based on recorded geomagnetic activity, and for the last 300 years Stefan et al. (2013) reconstructed Pw using information offered by models of the main geomagnetic field.

A new source of information on geoeffective solar activity has been found in certain long-term models of the main geomagnetic field, via residual 11-year signals present in the time series they provide. *Gufm1* (Jackson et al., Phil. Trans. R. Soc. London, 2000) and *COV-OBS* (Gillet et al., Space Sci. Rev., 2010) were used to get information on geoeffective solar activity before geomagnetic observatories era, for the last 400 years. According to the results presented at IAGA 2013 and AOGS 2014 general assemblies (see below, under ‚Conferences'), there was geomagnetic activity during Maunder and Dalton Minima, at least at the time scale of the solar magnetic cycle. Also, the retrieved geomagnetic signal (geo-effectiveness at the 22-year time scale) can discriminate problems in the past solar activity reconstructions based on ^{10}Be determinations.

Published papers

Dobrica, V., Demetrescu, C., Maris, G., 2012, Solar wind dynamic pressure and magnetopause stand-off distance before the instrumental era, *Sun and Geosphere*, 7, 45-48.

Greculeasa, R. A., Dobrica, V., Demetrescu, C., 2013, Sources of geomagnetic activity at mid-latitudes: Case study – European observatories, *Sun and Geosphere*, 8, 11-14.

Saiz, E., Cerrato, Y., Cid, C., Dobrica, V., Hejda, P., Nenovski, P., Stauning, P., Bochnicek, J., Danov, D., Demetrescu, C., Gonzalez, W.D., Maris, G., Teodosiev, D., Valach, F., 2013, Geomagnetic response to solar and interplanetary disturbances, *J. Space Weather Space Clim*., 3, A26, doi: 10.1051/swsc/2013048.

Stefan, C., Dobrica, V., Demetrescu, C., 2013, On the evolution of geomagnetic activity in the last 300 years. Implications regarding solar wind dynamic pressure and magnetopause standoff distance, *Sun and Geosphere*, 8, 7-10.

Conferences

Demetrescu, C., Dobrica, V., Maris, G., On the long-term evolution of the solar wind dynamic pressure on magnetosphere, 3rd *Workshop Solar influences on the ionosphere and magnetosphere, Sozopol, Bulgaria, June 6-10, 2011.*

Dobrica, V., Demetrescu, C., Maris, G., On the climate of the Sun-Earth system: The long-term evolution of the solar wind dynamic pressure on magnetosphere, *XXV IUGG General Assembly, Melbourne, Australia, June 28 –July 7, 2011.*

Demetrescu, C., Dobrica, V., Maris, G., Space climate: Toward a characterization at Hale and Gleissberg cycles timescales, *XXV IUGG General Assembly, Melbourne, Australia, June 28 –July 7, 2011.*

Demetrescu, C., Dobrica, V., Solar variability and space weather, *Scientific seminar, St.Mary's University, Halifax, Canada, 9-23 November 2011.*

Demetrescu, C., Dobrica, V., On the magnetosphere response to heliospheric activity, *Asia Oceania Geosciences Society (AOGS) Assembly, Singapore, 13-17 August 2012 (invited).*

Demetrescu, C. Dobrica, V., Mariş, G., On the climate of the solar – terrestrial space, *International Conference on Solar and Heliospheric Influences on the Geospace, Bucharest, Romania, 1-5 October 2012 (invited).*

Demetrescu, C., Dobrica, V., On the long-term evolution of the PC index, *European Geosciences Union (EGU) General Assembly, Vienna, Austria, 22-27 April 2012.*

Demetrescu, C., Dobrica, V., Space climate characterization of the heliosphere-magnetosphere environment, *First International Conference on Moldavian Risks – From Global to Local scale, Bacău, Romania, 16-19 May 2012.*

Demetrescu, C., Dobrica, V., Features of space climate seen in the solar-heliosphere-magnetosphere system, *The Fourth Workshop on Solar Influences on Magnetosphere, Ionosphere and Atmosphere, Sozopol, Bulgaria, 4-8 June 2012.*

Greculeasa, R., Dobrica, V., Demetrescu, C., Sources of geomagnetic activity at local scale. Case study – European observatories, *International Conference on Solar and Heliospheric Influences on the Geospace, Bucharest, Romania, 1-5 October 2012.*

Ştefan, C., Dobrica, V., Demetrescu, C., The evolution of the Earth's magnetic moment in the last 400 years. Consequences on the magnetopause standoff distance, I*nternational Conference on Solar and Heliospheric Influences on the Geospace, Bucharest, Romania, 1-5 October 2012.*

Demetrescu, C., Dobrica, V., Space climate characterization via geomagnetic indices. An attempt of integrating solar, heliospheric, and geomagnetic indices at various time-scales, *European Geosciences Union (EGU) General Assembly, Vienna, Austria, 7 – 12 April 2013.*

Dobrica, V., Demetrescu, C., Large-scale lithospheric magnetic anomalies in Europe as revealed by recorded geomagnetic storms at the observatory network, *European Geosciences Union (EGU) General Assembly, Vienna, Austria, 7 – 12 April 2013.*

Greculeasa, R., Dobrica, V., Demetrescu, C., Auroral electrojet and magnetospheric ring current effects in the disturbance field recorded at European Observatories, *European Geosciences Union (EGU) General Assembly, Vienna, Austria, 7 – 12 April 2013.*

Dobrica, V., Greculeasa, R., Demetrescu, C., On sources of the disturbance field recorded at European geomagnetic observatories, *The 6th MagNetE Workshop and Meeting of the EPOS WG 9 Magnetic Observations, Prague, Czech Republic, 3–5 June 2013.*

Demetrescu, C., Stefan, C., Dobrica, V., Magnetosphere response to solar activity during the Maunder Minimum, *The Fifth Workshop "Solar influences on the magnetosphere, ionosphere and atmosphere", Nessebar, Bulgaria, 3-7 June 2013.*

Stefan, C., Dobrica, V., Demetrescu, C., The magnetopause standoff distance: Short- and long-term variability, *The Fifth Workshop "Solar influences on the magnetosphere, ionosphere and atmosphere", Nessebar, Bulgaria, 3-7 June 2013.*

Demetrescu, C., Dobrica, V., Similar interdecadal evolution of magnetosphere and ionosphere current systems as seen in geomagnetic indices, PC included, *The XIIth Scientific Assembly IAGA 2013, Merida, Mexico, 26-31 August 2013.*

Demetrescu, C., Stefan, C., Dobrica, V., Geoeffective solar activity before geomagnetic observatory era. Insights from global models of the geomagnetic field. *The XIIth Scientific Assembly IAGA 2013, Merida, Mexico, 26-31 August 2013.*

Dobrica, C., Demetrescu, C., Greculeasa, R., Stefan, C., The geomagnetic disturbance field as a means to infer information on underground electrical structure. Case study – Europe, *The XIIth Scientific Assembly IAGA 2013, Merida, Mexico, 26-31 August 2013.*

Demetrescu, C., Stefan, C., Dobrica, V., Space climate. On geoeffective solar activity during Maunder and Dalton grand minima, *European Geosciences Union General Assembly, Vienna, Austria, 27 April – 02 May 2014.*

Greculeasa, R., Dobrica, V., Demetrescu, C., The disturbed geomagnetic field at European observatories. Sources and significance, *European Geosciences Union General Assembly, Vienna, Austria, 27 April – 02 May 2014.*

Haralambous, H., Vryonides, P., Demetrescu, C., Dobrica, V., Maris Muntean, G., Besliu-Ionescu, D., IRI STORM validation over Europe, *European Geosciences Union General Assembly, Vienna, Austria, 27 April – 02 May 2014.*

Stefan, C., Demetrescu, C., Dobrica, V., A Tentative reconstruction of the Dst index back to 1840, based on long time-span models of the core magnetic field, *The Sixth Workshop "Solar influences on the magnetosphere, ionosphere and atmosphere", Sunny Beach, Bulgaria, 26-30 May 2014.*

Demetrescu, C., Stefan, C., Dobrica, V., 400 years of space climate information from long-term main geomagnetic field models, *11th Annual Asia Oceania Geosciences Society (AOGS) Assembly, Sapporo, Japan, 28 July – 01 August 2014.*

Dobrica, V., Geomagnetism. Monitoring geomagnetic activity, *Seminar "Ionospheric research in Cyprus under quiet and disturbed geomagnetic conditions driven by space weather variability", Frederick University, Cipru, Nicosia, 3 November 2014.*

Demetrescu, C., Solar wind – magnetosphere – ionosphere interaction, *Seminar "Ionospheric research in Cyprus under quiet and disturbed geomagnetic conditions driven by space weather variability", Frederick University, Cipru, Nicosia, 3 November 2014.*

Demetrescu, C., Ştefan, C., Dobrică, V., Geoeffective solar activity before geomagnetic observatory era. Insights from global models of the geomagnetic field, *The Annual Scientific Session of the Institute of Geodynamics, Bucharest, Romania, 9-10 January 2014.*

Dobrica, V., Demetrescu, C., On the evolution of magnetosphere and ionosphere current systems as seen in geomagnetic indices, *The Annual Scientific Session of the Institute of Geodynamics, Bucharest, Romania, 9-10 January 2014.*

Greculeasa, R., Dobrica, V., Demetrescu, C., Sources of the geomagnetic activity as seen in European geomagnetic records, *The Annual Scientific Session of the Institute of Geodynamics, Bucharest, Romania, 9-10 January 2014.*

Patroi, A.C, Intense geomagnetic storms in solar cycle 24, *Faculty of Physics Session, Bucharest University, Bucharest, Romania, 20 June 2014.*

5. Solar/geomagnetic activity signatures in terrestrial climate data

The study of the influence of solar and geomagnetic activity on climate, begun in the previous report term (Dobrica et al, JASTP, 2009; Dobrica et al., Annals of Geophysics, 2010), has continued in the present report interval 2011-2014, the solar/geomagnetic forcing on the terrestrial climate being an important research line in the Institute of Geodynamics of the Romanian Academy.

While the Sun's role in determining the terrestrial climate is well-known, the role of the solar variability in producing climate variations is far from being understood. Our studies concerning the correlation between climatological parameters, including the North Atlantic variability as expressed by NAO and AMO indices (North Atlantic Oscillation and, respectively, Atlantic Multidecadal Oscillation) and the long-term solar/geomagnetic activities at the 11-year and magnetic (~22-year) solar cycles timescales have continued during the present term (see below, under 'Conferences') and have been extended to the Northern Hemisphere temperate zones in Europe, Asia, and North America. The latter is based on NCEP/NCAR reanalysed data (http://www.esrl.noaa.gov/psd/). Time-series of surface temperature between 1948 and 2012 on a grid of 2.5x2.5 latitude/longitude degrees have been processed to reveal characteristics at the 11- and 22-year time scales correlatable with solar/geomagnetic signals at the same timescales (Dobrica et al., 2012-2013). The same database provided data for an extension of the study to several tropospheric and stratospheric levels ('Conferences'). A similar temporal behaviour at all analysed grid points of the network over different climate zones with a minimum around ~1975 followed by a general increase in the last decades could be observed. Strong and coherent signals have been found at 11 and 22-year timescales, with variable amplitudes from surface to stratosphere: the 11-year signal is more pronounced in the troposphere, while the 22-year signal seems to be important in the stratosphere. The 11-year solar signal has amplitudes of about 4°C in winter and 2°C for other seasons. Maps of correlation coefficient (significance 95%), between stratospheric and troposheric NH temperatures, for annual and seasonal, and solar/geomagnetic indices, at solar cycle timescales, show well defined solar activity signal in temperature at local or regional scale rather than at the global one for troposheric levels, while in the stratosphere correlations of one sign characterize larger areas.

Along the same line of research, the long-term relationship between precipitation recorded at weather stations located in the Danube river basin, the discharge recorded at four hydrological stations on the Romanian territory, and the solar/geomagnetic activity have been investigated ('Conferences').

Published papers

Dobrica, V., Demetrescu, C., Stefan, C., Pirloaga, R., 2012-2013, Effects of the solar variability on the North temperate climate, *Romanian Geophysical Journal*, 56-57, 17-25.

Pirloaga, R., Dobrica, V., 2014, The North temperate climate on long-term timescales. Connection to solar variability, *Romanian Journal of Physics*, submitted,

Conferences

Dobrica, V., Demetrescu, C., Maris, G., On the response of the European climate to solar/geomagnetic long-term activity, *EGU General Assembly, Vienna, Austria, 3-8 April 2011.*

Dobrică, V., Demetrescu C., Long-term climate variations. Relationship with solar/geoagmetic activity, Scientific seminary, St.Mary's University, Halifax, Canada, 9-23 November 2011.

Dobrică, V., Şuţeanu, C., Demetrescu, C., Solar/geomagnetic signature in climate parameters. A comparative analysis of the temperature evolution in Atlantic Canada and Central Eastern Europe, *European Geosciences Union (EGU) General Assembly, Vienna, Austria, 22-27 April 2012*.

Şuţeanu, C., Dobrică, V., Demetrescu, C., Space time variability in scaling aspects of surface air temperature records, *European Geosciences Union (EGU) General Assembly, Vienna, Austria, 22-27 April 2012.*

Dobrică, V., Demetrescu, C., Long-term changes in the Romanian climate, *First International Conference on Moldavian Risks – From Global to Local Scale, Bacău, Romania, 16-19 May 2012.*

Dobrică, V., Demetrescu, C., Ştefan, C., Long-term variations of the 20th century European climate. Solar/geomagnetic signals. *Asia Oceania Geosciences Society (AOGS) Assembly, Singapore, 13-17 August 2012*.

Dobrică, V., Şuţeanu, C., Demetrescu, C., Long-term timescale interactions between solar/geomagnetic activity and European climate, *European Meteorological Society* (*EMS) Assembly, Lodz, Poland, 9-14 September, 2012*.

Dobrica, V., Demetrescu, C., Maris Muntean, G., Relationship at long-term timescale between the solar and Atlantic Ocean variability and European climate, *9th European Space Weather Week, Brussels, Belgium, 5-9 November 2012*.

Dobrică, V., Demetrescu, C., On the evolution of precipitation in Central and South-Eastern Europe and the relationship with Lower Danube discharge, *Fall Meeting of the American Geophysical Union (AGU), San Francisco, U. S. A., 3-7 December 2012*.

Suteanu, C., Dobrica, V., Demetrescu, C., A comparative approach to surface air temperature patterns and pattern change, *European Geosciences Union (EGU) General Assembly, Vienna, Austria, 7-12 April 2013*

Dobrica, V., Demetrescu, C., Signature of Hale and Geissberg cycles in geomagnetic activity and in climate parameters, *COST Action ES1005, WG2 workshop on the influence of interplanetary perturbations on the Earth's atmosphere and climate, Sunny Beach, Bulgaria, 13-16 May 2013.*

Dobrica, V., Demetrescu, C., Signature of Hale and Geissberg cycles in geomagnetic activity and in climate parameters, *COST Action ES1005, WG2 workshop on the influence of interplanetary perturbations on the Earth's atmosphere and climate, Sunny Beach, Bulgaria, 13-16 May 2013.*

Dobrica, V., Demetrescu, C., Interdecadal variability of precipitation in Europe and its connection with solar variability, *European Meteorological Society* (*EMS) Assembly, Reading, UK, 8-14 September 2013.*

Dobrica, V., Suteanu, C., Stefan, C., Pirloaga, R., Demetrescu, C., Geoeffective solar variability influence on Northern Hemisphere surface temperature, *European Geosciences Union General Assembly, Vienna, Austria, 27 April – 02 May 2014.*

Mares, I., Dobrica, V., Demetrescu, C., Mares, C., Moisture variability in the Danube lower basin: an analysis based on the Palmer drought indices and the solar/geomagnetic activity influence, *European Geosciences Union General Assembly, Vienna, Austria, 27 April – 02 May 2014.*

Demetrescu, C., Dobrica, V., Georgieva, K., Kirov, B., Solar signals in long time series of the Danube discharge data, *The Sixth Workshop "Solar influences on the magnetosphere, ionosphere and atmosphere", Sunny Beach, Bulgaria, 26-30 May 2014.*

Dobrica, V., Demetrescu, C., Stefan, C., Pirloaga, R., Effects of the solar variability on the north temperate climate, *The Sixth Workshop "Solar influences on the magnetosphere, ionosphere and atmosphere", Sunny Beach, Bulgaria, 26-30 May 2014.*

Dobrica, V., Pirloaga, R., Stefan, C., Demetrescu, C., Inferring geoeffective solar variability signature in stratospheric and tropospheric NH temperatures, *11th Annual Asia Oceania Geosciences Society (AOGS) Assembly, Sapporo, Japan, 28 July – 01 August 2014.*

Pirloaga, R., Dobrica, V., The North temperate climate on long-term timescales. Connection to solar variability, *Faculty of Physics Session, Bucharest University Bucharest, Romania, 20 June 2014.*

Acknowledgements. This report was prepared by Dr. Venera Dobrica, Dr. Diana Besliu-Ionescu, and Dr. Crisan Demetrescu.

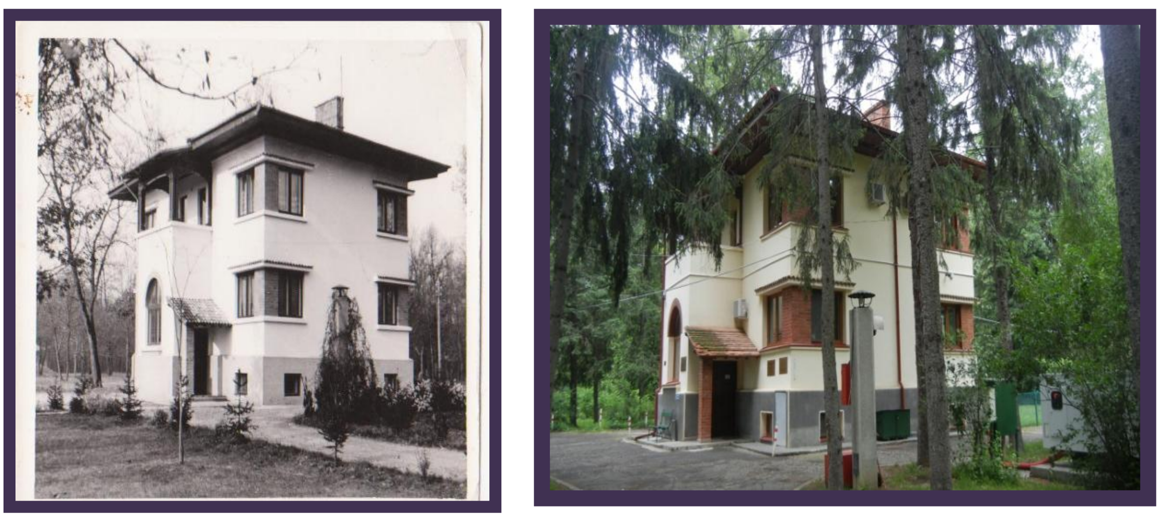
Division V: Geomagnetic Observatories, Surveys and Analyses

Working Group V-OBS: Geomagnetic Observation

1. National Geomagnetic Observatory (SUA)

Surlari Observatory(SUA) is the unique Romanian geomagnetic observatory and has been functional continuously for over 71 years. Founded by the Geological Institute of Romania on October 16, 1943, it plays a major part as the national reference station for all kinds of magnetic maps and a centre for fundamental research in both geomagnetic field and magnetic prospecting applications.

The Acad. Prof. Liviu Constantinescu, physicist, born on November 26, 1914 was one of the founders of the Romanian School of Geophysics and the scientific personality that marked the history of Surlari Observatory since its establishment -1943. His presence as the head of the Surlari Observatory for 15 years (1943-1957) consolidated its prestige on national and international level. Since 1998, Surlari observatory is an IMO (INTERMAGNET observatory).



Surlari Observatory, then and now, 1943-2014

Now, as INTERMAGNET member, the very first goal of Surlari team is to promote modernization of observatory practice in order to achieve the present and future IAGA standards. The continuous recording main and back up equipments consist of two suspended FGE fluxgate variometers (DTU), two GSM90 Overhauser magnetometers (Gem Systems) and two improved MAGDALOG dataloggers developed at Niemegk observatory, Germany for observatory practice only. For the absolute measurements a DI-Flux single axis magnetometer (Bartington) mounted on a Zeiss 010B theodolite and a G856 proton magnetometer (Geometrics) for scalar measurements are the magnetic reference instruments for variometers (see Figure 1).

GFZ German Research Centre, Helmholtz Centre Potsdam, in the frame of the second Cooperation Agreement, supports Surlari with further software upgrades and preparation of quasi and definitive data in order to improve data quality. They intend to renew the Cooperation Agreement from 2009 in order to further upgrade the traditional and reliable Surlari observatory with a second back-up recording system to fully meet the

INTERMAGNET requirements and ensure high, uninterrupted data quality. Here, all these new developments together with the checking and processing routine activities are upgraded - based on the operational methods and standards from data collection to rapid-delivery. With this upgrade, a long tradition of cooperation between Niemegk and Surlari observatory has been continued. Surlari observatory operates now more than one variometer, so an inter-comparison can be carried out. It is possible to detect problems of one of the variometers as base line jumps or drifts, scale value errors or internal or external perturbations.

The daily plot of delta-F is used to identify problems in FGE vector variometer. Jumps, spikes or drifts indicate problems of the base line values, scale values and internal or external magnetic perturbations.

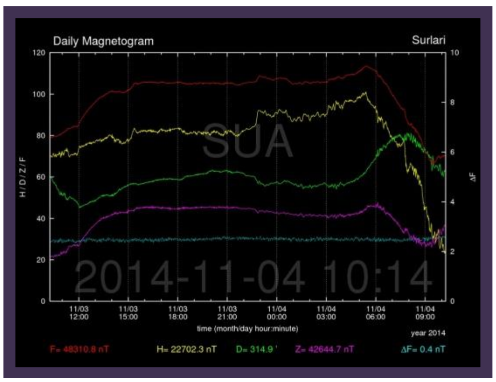


Figure 1. Plot of MAGDALOG-24 hours of Surlari observatory, displaying the vector variometer components H, D and Z, the independently recorded total intensity F and Delta-F calculated as Delta-F = sqrt($H^2 + Z^2$) – F.

The base line of these instruments is determined by means of regular DI-flux measurements (see Figure 2). The observatory staff was hardly trained to carry out the D and I absolute measurements by means of Bartington THEO 010B DI-Flux instrument. The comparisons of the old and modern systems and the first results of the absolute measurements reductions are made daily and monthly as an evaluation of Data Quality. Focus is now shifting to a high quality and reliable magnetic observatory.

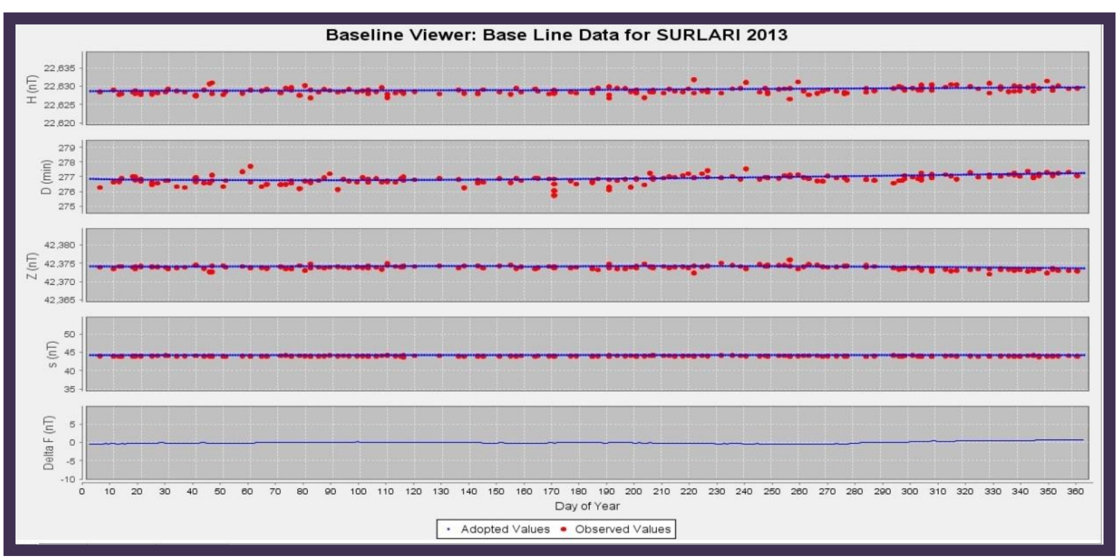


Figure 2. The base line of FGE-su0 variometer is determined by means of regular DI-flux measurements.

Research carried out at the observatory during its more than seventy years of continuous work has largely contributed to the Romanian geosciences field. Surlari National Geomagnetic Observatory takes part in many national, bilateral (Germany, Poland, Ukraine), regional or European cooperation programs, along with IAGA for momentary values, characterization indices of “magnetic status ” and international reference geomagnetic field (IGRF).

Real-time observatories, like SUA-Surlari National Geomagnetic Observatory, must be used for low-cost monitoring or “nowcasting” of Space Weather. And historical observatory data enable statistical studies of how storms are distributed in time and how big they can be. At present, a data base adequately structured, as well as a methodological experience in processing phenomena with large enough spatial distribution and spectrum of periods, will bring information of high interest not only in warning criteria for the magnetic status evolution, but also in the factors correlating these with some human activities.

Published papers

Mandea, M., Isac, A., 2011, Geomagnetic Field, Measurement Techniques, *Encyclopedia of Solid Earth Geophysics*, 381-385, Harsh K. Gupta (Ed.), Springer Science and Business Media B.V., DOI: 10.1007/978-90-481-8702-7 16;

Reda, J., Fouassier, D., Isac, A., Linthe, H.-J., Matzka, J., Turbitt, C., 2011, Improvements in Geomagnetic Observatory Data Quality, Geomagnetic Observations and Models, IAGA Special Sopron Book Series 5, 6, 127-148, M.Mandea and M.Korte (Eds.), Springer Science and Business Media B.V., (overview paper), DOI: 10.1007/978-90-481-9858-017;

Rokityansky I.I., Klymkovych, T.A., Babak, V.I., Isac, A., 2011, Annual and diurnal variations of induction vectors in relation to geodynamic processes, *Geomatics, Natural Hazards and Risk, Taylor & Francis* (Eds.), DOI: 10.1080/19475705.2011.601432, http://dx.doi.org/10.1080/19475705. 2011. 601432;

D.H., Constantinescu, A., Isac, M., Ivan, C. Postolache (Editors), 2014, Mesaje ale Pământului în descifrări actuale, L., Constantinescu (in Romanian), Integral, Academica collection, ISBN: 978-973-8209-09-1;

Linthe H.-L., Reda J., Isac A., Maska J., Turbitt C., 2012, Observatory Data Quality Check – The instrument to ensure the valuable research, *Proceedings of the XVth IAGA Workshop on geomagnetic observatory instruments, data acquisition and processing*, Extended Abstract Volume, Hejda P. (Ed.), San Fernando, Spain, 3/2013, 173-177, http://books.google.ro/ books?id=ugrpngEACAAJ;

Asimopolos L., Niculici E., Pestina A.M., Asimopolos N.S.,2012, Evaluarea câmpului geomagnetic prin metode statistice, spectrale si wavelet a datelor de observator – Editura Ars Docendi a Universitatii din Bucuresti, ISBN: 978-973-558-574-7, CIP: 550.38, 160 p. (in Romanian);

Asimopolos L., Sandulescu A.M., Asimopolos N.S., Niculici E., 2012, Analysis of data from Surlari National Geomagnetic Observatory, Ars Docendi, Bucharest University, ISBN: 978-973-558-588-4, 110 p.;

Asimopolos, L., Niculici, E., Pestina, A.M., Asimopolos, N.S., 2011, Comparisons of geomagnetic data measured in Romania with the data of International Geomagnetic Reference Field 11 (IGRF 11), Surveying Geology & Mining Ecology Management, DOI: 10.5593/sgem2011, 2, 25-32.

Conferences

Iancu, L., Gătej, M., Isac, A., 2014, Development in magnetic measurement techniques at Surlari observatory, GEO-2014, Scientific Meeting of the Faculty of Geology and Geophysics, University of Bucharest, 21 of November 2014;

Isac, A., Mandea, M., Linthe, H.-J, Gatej, M., Iancu, L., 2013, Surlari observatory ready for present and future, in the third millenium, The 12th *IAGA Scientific Assembly*, *August 26-31*, *2013*, *Yucatan*, *Mexico*, Abstract Volume, J.Jesus Silva Corona and Harald Bohnel (Eds), 5.1-48p;

Isac A., Mandea M., Soare, A., 2012, Surlari Geomagnetic Observatory: role into Space and Earth Weather concept, First International Conference on *MOLDAVIAN RISKS – FROM GLOBAL TO LOCAL SCALE*, 16-19 May 2012, Bacau, Romania;

Iancu, L., Gatej, M., Isac, A., Mandea, M., Linthe, H.-J., 2012, Surlari National Geomagnetic Observatory: its history from the first measurements to its participation in INTERMAGNET, *The* XVth *IAGA Workshop on Geomagnetic Observatory Instruments*, *Data Acquisition and Processing*, June 4-14, 2012, San Fernando, Spain;

Isac, A., Linthe, H.-J., Mandea, M., Iancu, L., 2012, The renewing of Surlari observatory: targets and present status of its data quality, *The* XVth *IAGA Workshop on Geomagnetic Observatory Instruments*, *Data Acquisition and Processing*, June 4-14, 2012, San Fernando, Spain;

2. National Network of Repeat Stations

Since about 1964 a systematic survey of the geomagnetic field at the National network of repeat stations has been undertaken. The network (26 stations at present) is being reoccupied as much as possible every year. Measurements have been done in the report time interval by means of a LEMI-204 DIFlux instrument, 2 Geometrics G-856 proton magnetometers, and 2 QHMs. The values obtained for the geomagnetic elements H, D, I, Z and F have been reduced to the middle of the year (geomagnetic epoch year.5) in which measurements were taken, by means of records provided by the Surlari geomagnetic observatory (IAGA code SUA). Results have been reported at MagNetE (Magnetic Network of Europe) meetings (see below, under ‘Conferences’).

MagNetE initiative started in 2003 with an aim at supplementing observatory data at a regional and national level by means of systematic geomagnetic measurements at repeat stations. An important result of this initiative was the Magnetic Declination Map of Europe for the epoch 2006.0, scale 1:20,000,000, based on measurements at national level. The map was published by the Commission for the Geological Map of the World (CCGM) in 2012 (Duma et al., 2012).

Recordings taken in the stations of the repeat network in 2010, by means of a LEMI-018 magnetic variometer and of a G-856 Geometrics proton magnetometer, were used to infer information on the lateral variation on the Romanian territory of the crustal bias that characterizes each repeat station (Dobrica et al., 2012). A magnetic induction model was applied to recordings. The model is based on the observation that a variable external magnetic field induces a response of the Earth's interior not only by electromagnetic induction, but also by magnetic induction in the magnetic rocks above the Curie temperature. The model computes coefficients of a linear relationship between recorded values of a certain geomagnetic element (X, Y, Z, or F) at the repeat station and recorded X, Y, Z values at a reference station (in this case, SUA observatory). Coefficients depend on magnetic permeabilities of rocks beneath the station and stand as a proxy for the anomaly bias characterizing the site. Maps of the lateral variation of this type of information were obtained and discussed.

Published papers

Dobrica, V., Demetrescu, C., Greculeasa, R., Isac, A., 2012, On the crustal bias of repeat stations in Romania, *Annals of Geophysics*, 55, 1145-1154, doi: 10.4401/ag-5442.

Duma, G., Leichter, B., and the MagNetE Group (28 co-authors), 2012, Map of Magnetic Declination in Europe 2006, Scale: 1:20,000,000, Commission for the Geological Map of the World (CCGM). (Magnetic Declination Chart 2006 of Europe – produced by the MagNetE Group, *Annals of Geophysics*, 55, 6, 1053-1059, 2012; doi: 10.4401/ag-5575)

Conferences

Dobrica, V., Demetrescu, C., Greculeasa, R., Isac, A., Romanian secular variation network measurements in 2009-2010, *5th MagNetE Workshop, 8-11 May, Rome, Italy, 2011.*

Dobrică, V., Demetrescu, C., Greculeasa, R., On the crustal bias of repeat stations in Romania, *European Geosciences Union (EGU) General Assembly, Vienna, Austria, 22-27 April 2012.*

Greculeasa R., Dobrică V., Demetrescu C., The Romanian network of repeat stations. Methodological aspects 2009-2011. *European Geosciences Union (EGU) General Assembly, Vienna, Austria, 22-27 April 2012.*

Greculeasa, R., Dobrică, V., Demetrescu, C., Recent measurements in the Romanian network of repeat stations, *GEO-2012 National Session, Bucharest, Romania, 25-26 May 2012*.

Greculeasa, R., Dobrică, V., Demetrescu, C., Methodological aspects of the repeat station survey in 2009-2011, *Physics Faculty Session, Bucharest University, Bucharest, Romania, 22-23 June 2012.*

Greculeasa, R., Dobrica, V., Demetrescu, C., The Romanian network of repeat stations. Geomagnetic measurements 2011-2012, *The 6th MagNetE Workshop and Meeting of the EPOS WG 9 Magnetic Observations, Prague, Czech Republic, 3-5 June 2013.*

Greculeasa, R., Dobrica, V., Demetrescu, C., Five years (2009–2013) of geomagnetic measurements in the national network of secular variation, *GEO-2014 Național Session, Bucharest, Romania, 21 November 2014.*

Working Group V-MOD: Geomagnetic Field Modeling

A. Secular variation studies

1. Secular variation. New insights from long time series of observatory data and long-term main field models

The annual means from 24 observatories world wide with 100-150 years long time series were analyzed. The existence of high frequency secular variation ingredients at 11, 22 and ~80 years timescales, superimposed on a so-called steady variation that carries the largest part of the field has been revealed. These ingredients are highly significant in terms of secular variation at regional and local scale, as well as in defining the geomagnetic jerks. The analysis of 400 years-long declination time-series from three European locations (London, Munich, Rome) resulted in tracing back of the ~80-year variation to the 15^{th} century and showed that what we called 'steady variation', based on 150 years of observatory data, proves to be only a part of a larger timescale variation, when 400 years of data are available. According to our results, the term 'jerk' loses its presently accepted meaning of sudden change in the temporal evolution of secular variation. A more complex concept in describing the secular variation of the main field, namely the superposition of several effects, corresponding to specific core processes at various time scales, should be used instead (Demetrescu and Dobrica, 2014). Also, data from the European network of geomagnetic observatories in the time interval 1960 – 2004, have been processed to obtain a complex and detailed model of the lateral and temporal evolution of the main geomagnetic field and of its secular variation (Dobrica et al., 2013).

The above principles have been extended to the field at the core-mantle boundary as expressed by *gufm1* and *COV-OBS* main field models and the ~80-year variation was shown (see below, under 'Conferences') to explain the westward moving equatorial flux patches reported by Finley & Jackson (Science, 300, 2003) in a much larger (400 years) temporal window. An application of the Radon transform, to infer the traveling speeds of the ~80-year variation at the core-mantle boundary level, was published (Stefan, 2012-2013).

Published papers

Demetrescu, C., Dobrica, V., 2014, High-frequency ingredients of the secular variation of the geomagnetic field. Insights from long series of observatory data, *Physics of the Earth and Planetary Interiors*, 231, 39-55, doi: 10.1016/j.pepi.2014.03.001.

Dobrica, V., Demetrescu, C., Stefan, C., 2013, Toward a better representation of the secular variation. Case study: the European network of geomagnetic observatories, *Earth, Planets, Space*, 65, 767–779, doi:10.5047/eps.2012.12.001.

Stefan, C., 2012-2013, Application of the Radon transform to the study of traveling speeds of core geomagnetic field features. Case study – The ~80-year variation, *Romanian Geophysical Journal*, 56-57, 11-17.

Conferences

Dobrica, V., Demetrescu, C., On the time evolution of declination at geomagnetic observatories with long records, *5th MagNetE Workshop, 8-11 May, 2011.*

Demetrescu, C., Dobrica, V., Toward changing a paradigm? New insights on geomagnetic jerks from long time-series of geomagnetic data and models, *XXV IUGG General Assembly, Melbourne, Australia, June 28 –July 7, 2011*.

Demetrescu, C., Dobrică, V., Ştefan, C., On the evolution of high-frequency ingredients of the secular variation and of their expression at core surface, as inferred from observatory data and main field models, *European Geosciences Union (EGU) General Assembly, Vienna, Austria, 22-27 April 2012*.

Ştefan, C., Dobrică, V., Demetrescu, C., On the ~80-year variation of the core surface geomagnetic field. Derivation and characteristics, *European Geosciences Union (EGU) General Assembly*, Vienna, *Austria, 22-27 April 2012*.

Demetrescu, C., Dobrică, V., Ştefan, C., Long-term evolution of high-frequency ingredients of ingredients of the core surface field, *Fall Meeting of the American Geophysical Union (AGU), San Francisco, U. S. A., 3-7 December 2012*.

Ştefan, C., Dobrică, V., Demetrescu, C., Characteristics of the radial field at the core-mantle boundary, *GEO-2012 Naţional Session, Bucharest, Romania, 25-26 Mai 2012*.

Ştefan, C., Demetrescu, C., Dobrică, V., The space-time evolution of the geomagnetic field at core surface, *Physics Faculty Session, Bucharest University, Bucharest, Romania, 22-23 June 2012*.

Demetrescu , C., Stefan, C., Dobrica, V., External field noise in main field models at Earth's surface and at core/mantle boundary, *European Geosciences Union (EGU) General Assembly, Vienna, Austria, 27 April – 02 May 2014.*

Stefan, C., Demetrescu, C., Dobrica, V., On the characteristics of a residual external signal seen in coefficients of main geomagnetic field models, *European Geosciences Union General Assembly, Vienna, Austria, 27 April – 02 May 2014.*

Ştefan, C., Characteristics of the radial component of the geomagnetic field at core surface, *The Annual Scientific Session of the Institute of Geodynamics, Bucharest, Romania, 9-10 January 2014.*

2. Induction studies: The geomagnetic disturbance field recorded at observatories as a means to infer information on the underground electrical structure

The variable external geomagnetic field induces a response of the Earth's interior both by magnetic induction in the magnetic rocks above the Curie temperature and by electromagnetic induction in the conductive crustal and mantle structures. These two components of the internal response are evidenced in case of the external variation, by means of a magnetic induction model applied to the mentioned variation. The calculated values of the model carry information on the magnetic properties of (generally) crustal rocks, while the model residuals carry information of the electric properties of mantle and crustal conductive structures. As inducing magnetic field the variation recorded during nine intense geomagnetic storms (Dst<-150 nT) in the solar cycle 23 (1997-2009) were used. Results were presented at international meetings (see below, under 'Conferences'). Based on the two components of the internal response, information on the lateral variation of the magnetic properties of the crust down to the Curie temperature and of the electric properties of the crust and mantle was inferred.

Conferences

Dobrica, V., Demetrescu, C., Large-scale lithospheric magnetic anomalies in Europe as revealed by recorded geomagnetic storms at the observatory network, *European Geosciences Union (EGU) General Assembly, Vienna, Austria, 7 – 12 April 2013.*

Dobrica, V., Demetrescu, C., Greculeasa, R., Stefan, C., The geomagnetic disturbance field as a means to infer information on underground electrical structure. Case study – Europe, *The XIIth Scientific Assembly IAGA 2013, Merida, Mexico, 26-31 August 2013.*

Greculeasa, R., Dobrica, V., Demetrescu, C., The disturbed geomagnetic field at European observatories. Sources and significance, *European Geosciences Union General Assembly, Vienna, Austria, 27 April – 02 May 2014.*

3. Contributions in spectral techniques applied to geomagnetic time-series

The objective is focusing on some temporal characteristics the Earth's magnetic field, with with a special interest to the core magnetic field and its secular variation. In order to explain the possible rapid evolution of the main magnetic field and to detect singular events such as jerks (short-term variations) in the geomagnetic field time series, long-time series of data and spectral analysis methods are used. Two methods of spectral analysis, Short Time Fourier Transform and Discrete Wavelets Transform, are applied first to a synthetic signal and then to long series of data provided by Surlari observatory, to detect singular events such as jerks in the geomagnetic field time series. In order to detect particular events in the SV series, the specgram function of Matlab7 software which computed the windowed discrete time Fourier transform of a signal, using sliding windows of Gaussian-like form with a diferent length and diferent overlaps, was used. The resulted spectrogram is shown in Figure 1. It is clearly observed from analyzing this spectrogram, that geomagnetic jerks are present around 1970, 1990 and 2000, the best case being when the moving window had a 12-months length. For 50's, even the monthly mean series of Y component shows a great amount of noise, due to a weaker quality of data, changes in the trend appear around 1954 and 1959.

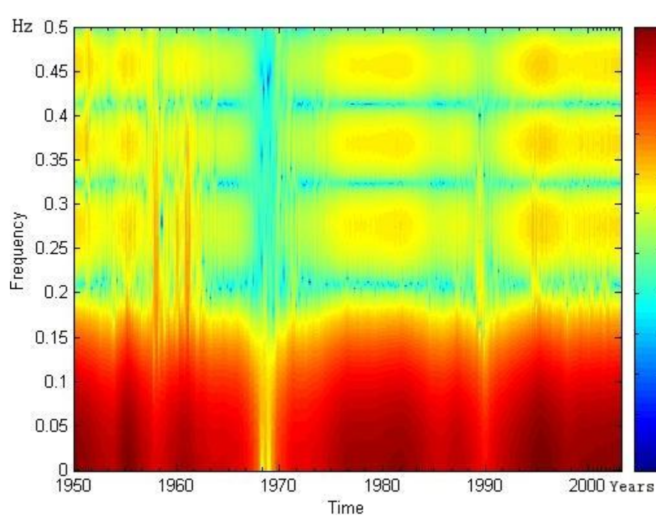


Figure 1. Spectrogram of monthly values series of the secular variation of Y component (12 - months moving average) at Surlari observatory (1950 - 2004).

Considering again Surlari observatory, with its original 12-months averaged signal, it was possible to get, via the wavelet analyses, the de-noised signal of the monthly SV value series, by applying the Db3 wavelets at level 5 decomposition.

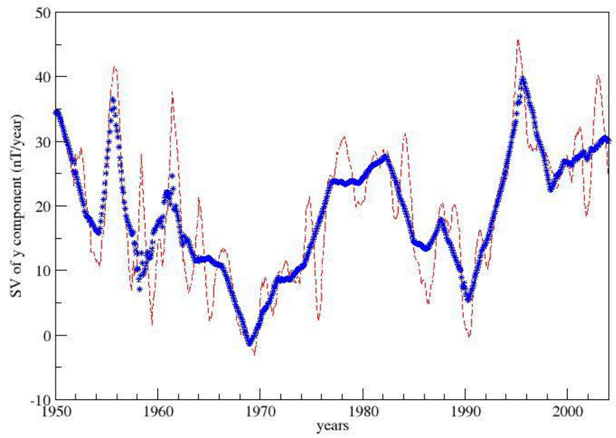


Figure 2: Secular variation (SV) time series of Surlari, calculated by 12-months moving average from y component (red) and its de-noised signal of the series decomposition by Db3 wavelets of level 5 (blue), in nT/year.

The result is shown on Figure 2, together with the initial data. The new time-series is clearly less contaminated by external field contributions. Then, the obtained signal, without distortion of the signal itself, was used to apply the Db3 wavelet for the wavelet decomposition of level 2. The results show evidences of diferent kind of events, including some of the wellknown geomagnetic jerks, which have been seen before, in the spectrogram. Thereafter, the observed maxima are situated around dates of well-known jerks: 1970, 1980, 1990 and 2000. All dates are somehow found to be with a couple of years after the other jerk dates determined previously. The double maxima after 1970 has to be investigated in more detail taken into account the data quality of Surlari and the diferent behavior of SV over the globe.

To understand these specific characteristics, short-term variations of the main field, it is crucial to analyze long series of data, provided by geomagnetic observatories or deduced from satellite measurements and models. The wavelet analysis is also applied to monthly value series of secular variation generated by Gufm1 model at few hundreds points uniformly distributed over the Earth's surface. Such data was used instead of real data of geomagnetic observatories in order to have time series from a regular (uniform) grid of points over the Earth. The presence of noise in the data makes the identification of short-term discontinuities more complicated. For this reason, a de-noising technique using wavelets was applied for the global scale model Gufm1 (Jackson et al., 2000), too. Each time series of all 212 points is decomposed by Db2 wavelets at level 2, saving the d1 coeficients of decomposition. Then, the squared average value of such coeficients for every year of the selected period, over the Earth, was calculated. From such plots, information about the spreading and evolution of geomagnetic field jerks (Duka et al., 2012) is given (Figure 3).

The obtained results for synthetic signals and for Surlari observatory proved that the chosen methods are appropriate to characterize geomagnetic jerks. The wavelet analysis applied to monthly series of secular variation generated from the global scale

Gufm1 model points out that spectral methods chosen can highlight, both in time and space geomagnetic jerks in secular variation of the magnetic field. The behavior of wavelet decomposition coeficients, for almost every year of the ninetieth century and for each point, gives an interesting view about the spreading and evolution of jerks (Figure 3). Actually, the deviation of d1 coeficients from their mean value of the whole period was plotted. In such way, the white areas correspond to the regions where the d1 values are less than the mean value, and the colored areas, correspond to regions where the values d1 are the greatest than the average.

Most of the well known jerks are confirmed through these methods and new and interesting features have been suggested, such as a longitudinal-like periodicity. These particular events, geomagnetic jerks, with a signature identical with strong fields of the d1 coeficients, are not globally extended over the whole globe, in the same time. For example, starting with the 1901 event, stronger field is concentrated in four longitudinal belts, and as well as is the case in 1925, when the largest one is in the center. From 1945 until 1949, strong fields have a large spread in many longitude belts. The well known geomagnetic jerk, in 1969 is presented as a spot over Europe and only one eastern belt. The 1978 jerk is shown as local strong fields over some regions on the Earth. The 1986 jerk is represented as a large longitudinal area over the African and South pole region.

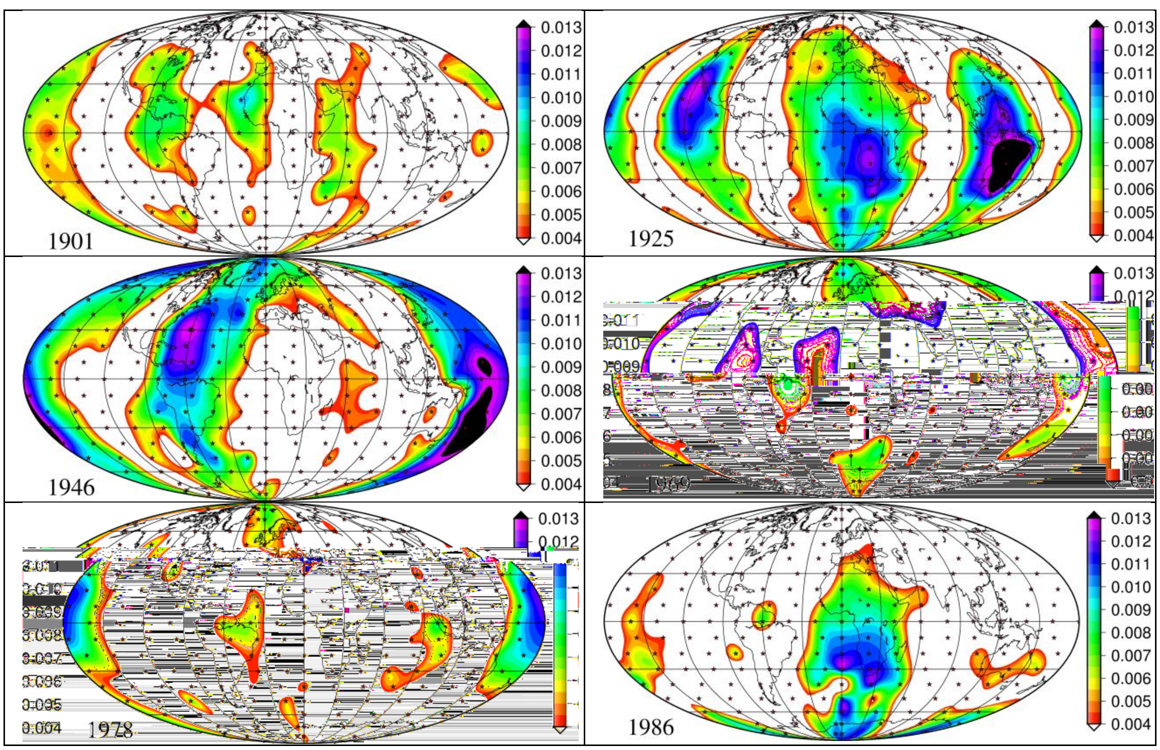


Figure 3: The d1 coeficient behavior, for the epochs: 1901, 1925, 1947, 1969, 1978 and 1986, a selection from the movie by Duka et al. (2012).

Using both national data and global models and maps it was highlighted their regional rather than global behavior, as previously thought. On the same line of analysis the temporal variability of the magnetic field, applying a Nonlinear Forecasting Approach on the Gufm1 values, the wellknown jerks detected by diferent methods have been confirmed with or without a time offset. In addition, few others have been detected, over a period of four centuries.

Published papers

Duka B., De Santis, A., Mandea, M., Isac, A., Qamili, E., 2012, Geomagnetic jerks characterization via spectral analysis, *Solid Earth*, Interactive Open Access Journal, Copernicus Publications, doi:10.5194/sed-3-131-148, 2012, www.solid-earth.net/3/131/2012/, doi:10.519/se-3-131-2012;

Qamili E., De Santis A., Isac A., Mandea, M., Duka B., 2013, Geomagnetic jerks as chaotic fluctuations of the Earth's magnetic field, G-Cubed – Geochemistry, Geophysics, Geo-systems, (G3), 14, 4, DOI: 10.1029/2012GC004398(13).

Conferences

Qamili E., De Santis A., Isac A., Mandea M., Duka B., Simonyan A., 2014, Geomagnetic jerks as chaotic features of our planet, EGU General Assembly 2014, Vienna, Geophysical research Abstracts, Vol. 16, EGU2014-5249.

Acknowledgements. This report was prepared by Dr. Crisan Demetrescu, Dr. Venera Dobrica and Dr. Anca Isac.

IAHS ACTIVITIES IN ROMANIA

2011 - 2014

Romanian IAHS Committee

National Correspondents:
Presidents of the Committee:

Mary-Jeanne ADLER
National Institute of Hydrology and Water Management
Phone: +40-21-3181116
Fax: +40-21-3181116
E-mail: mj.adler@hidro.ro

Members:

Radu DROBOT
Technical University of Civil Engineering
Phone: +40-21- 2421208/115
Fax: +40-21- 2421870
E-mail: drobot@utcb.ro

Liliana ZAHARIA
University of Bucharest,
Phaculty of Geography
Phone: +40-21-
Fax: +40-21-
E-mail: simona.matreata@hidro.ro

Carmen MAFTEI
Ovidius University
Phone:
Fax:
E-mail: cemaftei@gmail.com

Mita POMPILIU
Romanian Association of Hydrology
Phone: +40-21-3181115/126
Fax: +40-21-3181116

Valentina UNGUREANU
National Administration “Apele Romane”
Phone: +40-21-0744522320
Fax: +40-21- 3122174
E-mail: valentina.ungureanu@rowater.ro

Laura DUTU
National Research and Development Institute for Marine Geology and Geoecology
Phone: +40-21-252.55.12
Fax: +40-21-252.25.94
E-mail: laura.dutu@geoecomar.ro

Secretary:

Ada PANDELE
National Institute of Hydrology and Water Management
Phone: +40-21-3181115, ext.167
Fax: +40-21-3181116
E-mail: ada.pandele@hidro.ro

SUMMARY

Chapter 1. ROMANIAN ASOCIATION OF HYDROLOGICAL SCINCES (AHS) ORGANIZATION

AHS organization in Romania followed the IAHS Commissions:

- International Commission on Surface Water
- Groundwaters
- Coupled Land-Atmosphere Systems
- Remote Sensing
- Tracers
- Statistical Hydrology
- International Commission on Continental Erosion
- Snow and Ice Hydrology

The activities of AHS organization in Romania was coordinated by the Romanian AHS committee.

Romanian AHS activities implied not (???) different specialists and researcher in hydrology, working under different professional organizations, institutions, and univeristies like:

Romanian Association of Hydrological Sciences
National Administration Romanian Waters
National Institute of Hydrology and Water Management
National Institute for Environment Protection Research and Development
National Institute of Research and Development - “Delta Dunarii”
National Institute of Marine Research and Development
Institute of Geography Bucharest
Geoecomar, Bucharest
Technical University of Civil Engineering, Bucharest,
University of Bucharest,
Politechnical University, Bucharest,
University Gheorghe Asachi, Iaşi
Ovidius University, Constanţa,
University of Cluj
University of Agronomic Science and Veterinary Medicine, Bucharest- Faculty of Land Reclamation and Environment Engineering

Chapter 2. MAIN RESEARCH ORIENTATION IN THE FIELDS OF HYDROLOGICAL SCIENCES

The new scientific decade 2013–2022 of IAHS, entitled “Panta Rhei – Everything Flows”, is dedicated to research activities on change in hydrology and society. The purpose of Panta Rhei is to reach an improved interpretation of the processes governing the water cycle by focusing on their changing dynamics in connection with rapidly changing human systems. During the last three years the Romanian hydrology achieved its activity through several exquisite research works covering practically all branches of hydrology, looking more carefully at anthropogenic and climate change impact on hydrological regime; data monitoring and measurement techniques, data analysis and innovative monitoring strategies by taking advantage of new technologies and new generations of data, analyzing hydrological processes determine by determining water related risks and water security and better defining the relationship between environment and humans.

Cooperation among researchers through science initiatives, exchange programmes and virtual laboratories is fundamental for the ongoing success of hydrological science as well as education and growth of the community. Romanian Hydrology tried to be more active oppend to society, to stakeholders and population as an all by using discussion and cooperation, public consultation in any changing plan at the basin level, bying river basin management plan or flood risk management plan. Interdisciplinarity in planning the environment change is essential, and we look more carefully to the social component of hydrological process.

The most important results we considered are reached by climate change impact estimation for almost all Romanian river systems, looking at global water resources availability, but also to extrems, floods and droughts frecquency. Having a better understanding about the small scale hydrological processes and integrating results at large scale of the river systems under changes pressures, identifying incertainity in our future predisction, are aspects we concentrated through our research, contributing in at a certain level to Panta Rhei Research Decade activity.

2.1. Research on surface waters

2.1.1. Climate Changes Impact on the Hydrological regime on Romanian Rivers

In order to determine the vulnerability of water resources to climate change, and establish certain adaptation measures in each river basin, specific analyses are required to estimate the impact of climate change on water resources in the respective basins.

Taking into account this necessity, the main objective of the study is to estimate the impact of climate change on the regime of mean discharge of the rivers in Romania, based on long-term simulations performed using a hydrological model using as input precipitation and temperature series resulted from the climatic evolution simulations performed with a regional meteorological model.

The employed methodology is based on the following steps:

- ***Establishment of climate change scenario*** that includes simulations of climate evolution obtained using a meteorological model, simulations that are available on a grid network with as good spatial resolution as it can be obtained. Two types of simulations were available: one simulation obtained in a control run, for a historical period, in order to establish a reference climate regime and a proper simulation of the evolution of greenhouse gas emission scenario for a future period, using as boundary conditions the simulations made with ocean-atmosphere coupled global meteorological model.

- ***Meteorological data input preprocessing at a temporal and spatial resolution appropriate to the hydrological modeling requirements*** by conducting the following operations: patching the simulated values using statistical methods and grid data set based on observations, with good temporal and spatial resolution; achieving a temporal downscaling on the corrected values, from the available time step to the time step necessary to the hydrological model and the creation of a spatial downscaling on meteorological values from the available resolution to the one required by the hydrological model.
- ***Collection of mean precipitation and temperature series on sub-basins***, at the calculation time step, according to the topological scheme used by the hydrological model for the analyzed river basins, using meteorological data series input in grid format.
- ***Calibration of the hydrological model***, which is performed using historical data, is then used with the optimal set of parameters resulting from the calibration, in order to achieve long-term simulations of discharge series using data from climate scenarios.
- ***Simulation of runoff on two lengthy periods using the hydrological model***, the first simulation is performed for the reference period, and the second for the next period. The simulations are done for the natural runoff regime, without taking into account the influence of reservoir exploitation, in order to estimate the impact of climate change on the hydrological regime.
- ***The analysis of the results of the impact study on climate change and variability impact on the hydrological regime of mean monthly discharges, seasonal and annual***

The methodology presented was applied on seven river basins in Romania, namely (Figure 1): Somes (having a catchment area of 15,740 km^2 which represents 6.6% of the country), Mures (27,890 km^2; 11.7%), Jiu (10,080 km^2, 4.2%), Olt (24050 km^2; 10.1%), Arges (12550 km^2, 5.3%), Ialomita (10,350 km^2; 4.4%) and Siret (42 890 km^2; 18.1%).

In total, the surface of the 7 analyzed river basins is 143550 km^2, representing 60,4 % of the surface of the country.

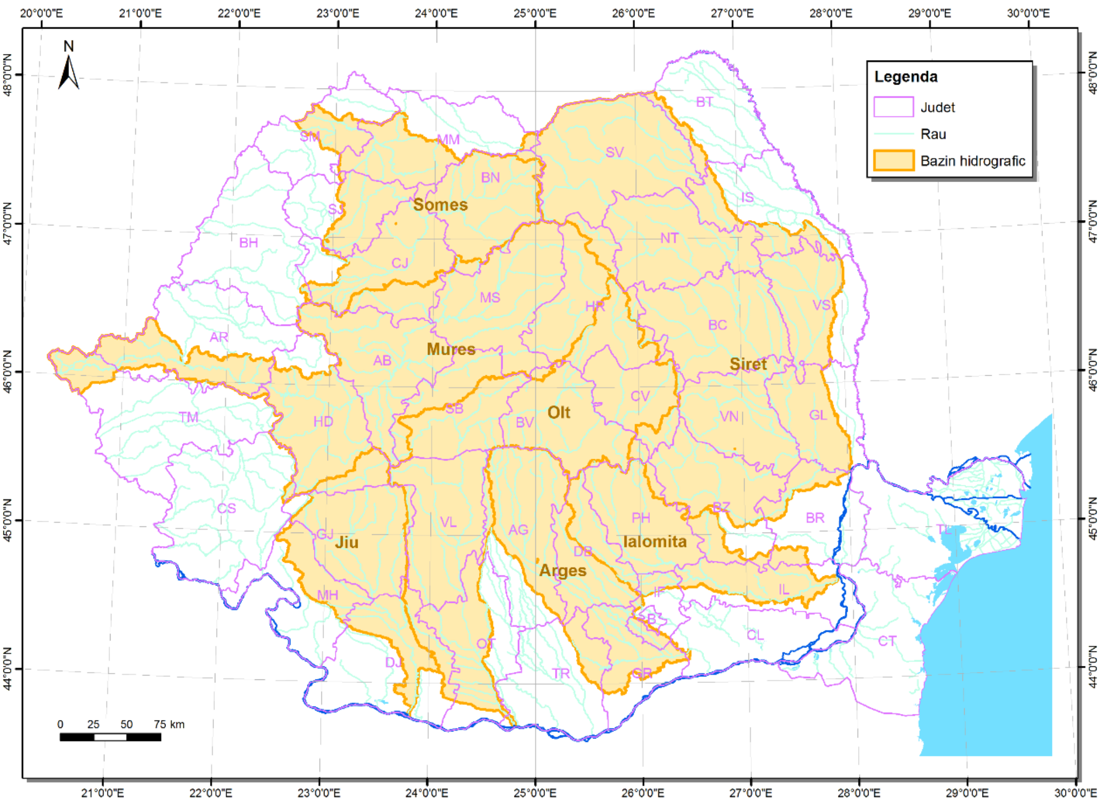


Figure 1. River basins from Romania for which the study regarding the estimation of climate

change impact on the regime of mean discharges was made

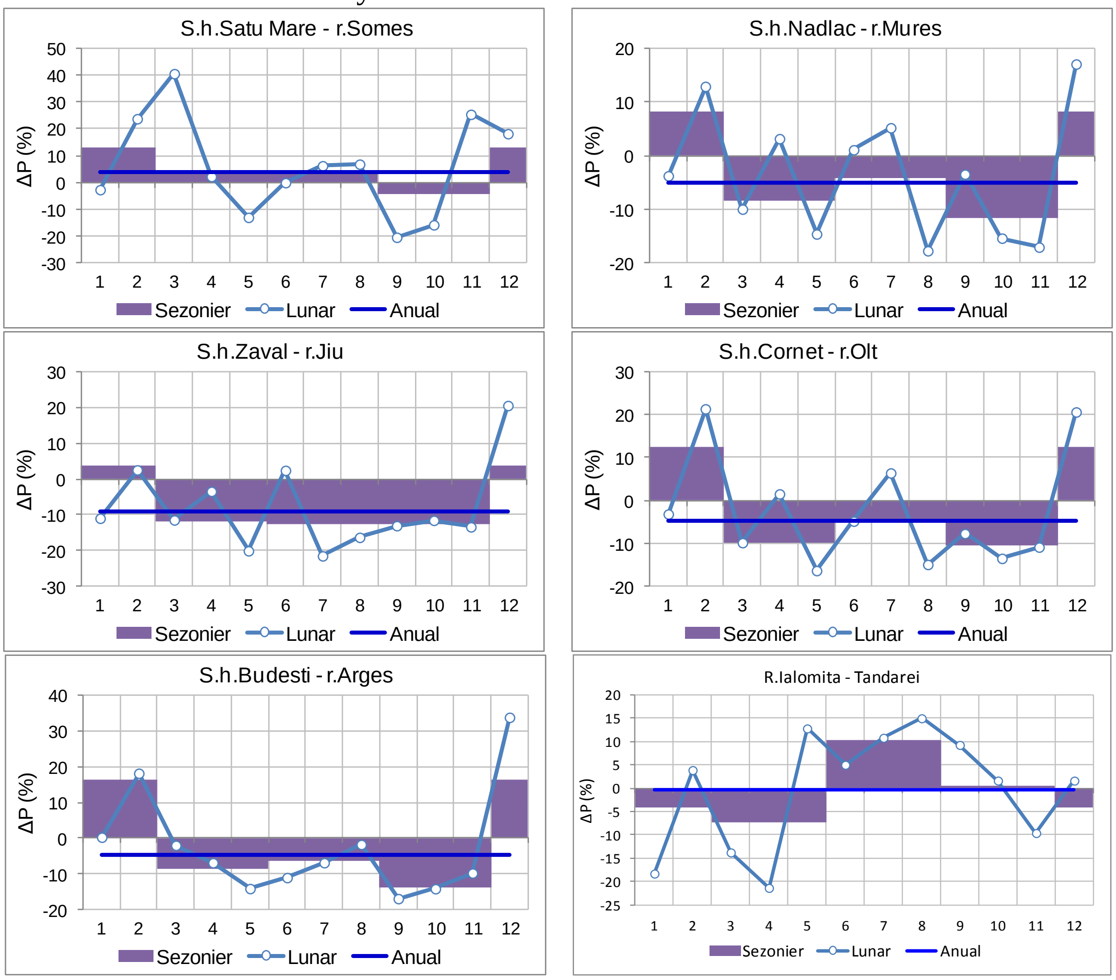
To estimate the impact of climate change and variability on monthly average flow regime, seasonal and annual in the analyzed river basins, long-term simulations were performed using two hydrological models. Thus, in the Somes and Ialomita river basins, the WatBal hydrological model was used and in the Mures, Jiu, Olt, Arges and Siret river basins, the CONSUL model was used.

The calibration of parameters from the hydrological models used to simulate runoff in the analyzed river basins was done for the WatBal model by simulating runoff during the 1971-2000 period, and for the CONSUL model by simulating flow during the 2000-2006 period.

The simulations with the hydrological models used, having optimal parameters obtained from the calibration process, have been completed for two time periods: during the reference period 1971 - 2000 and respectively future period 2021 - 2050 to 200 selected gauging stations of the 7 river basins analyzed (33 Somes river basin, Mures 40; 24 in the Jiu, 28 in Olt, 26 in Arges, 13 in Ialomita and 36 in Siret).

For the input data in the hydrological models, namely precipitation and average temperature series on the sub-basins corresponding to the analyzed hydrometric stations, a comparative analysis was performed for the two periods considered.

For example, Figure 2 shows the relative deviation of rainfall and temperature deviations in Figure 3, monthly values, seasonal and annual multiannual from the period 2021-2050 compared to the reference period 1971-2000, averages on river sub-basins corresponding to the closing hydrometric stations from the analyzed river basins.



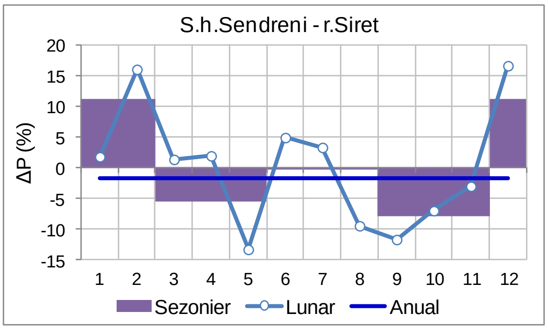


Figure 2. Relative deviations of monthly, seasonal and annual multiannual precipitation (ΔP), from the 2021 – 2050 period compared to the reference period 1971 – 2000, at the closing hydrometric stations from the analyzed river basins

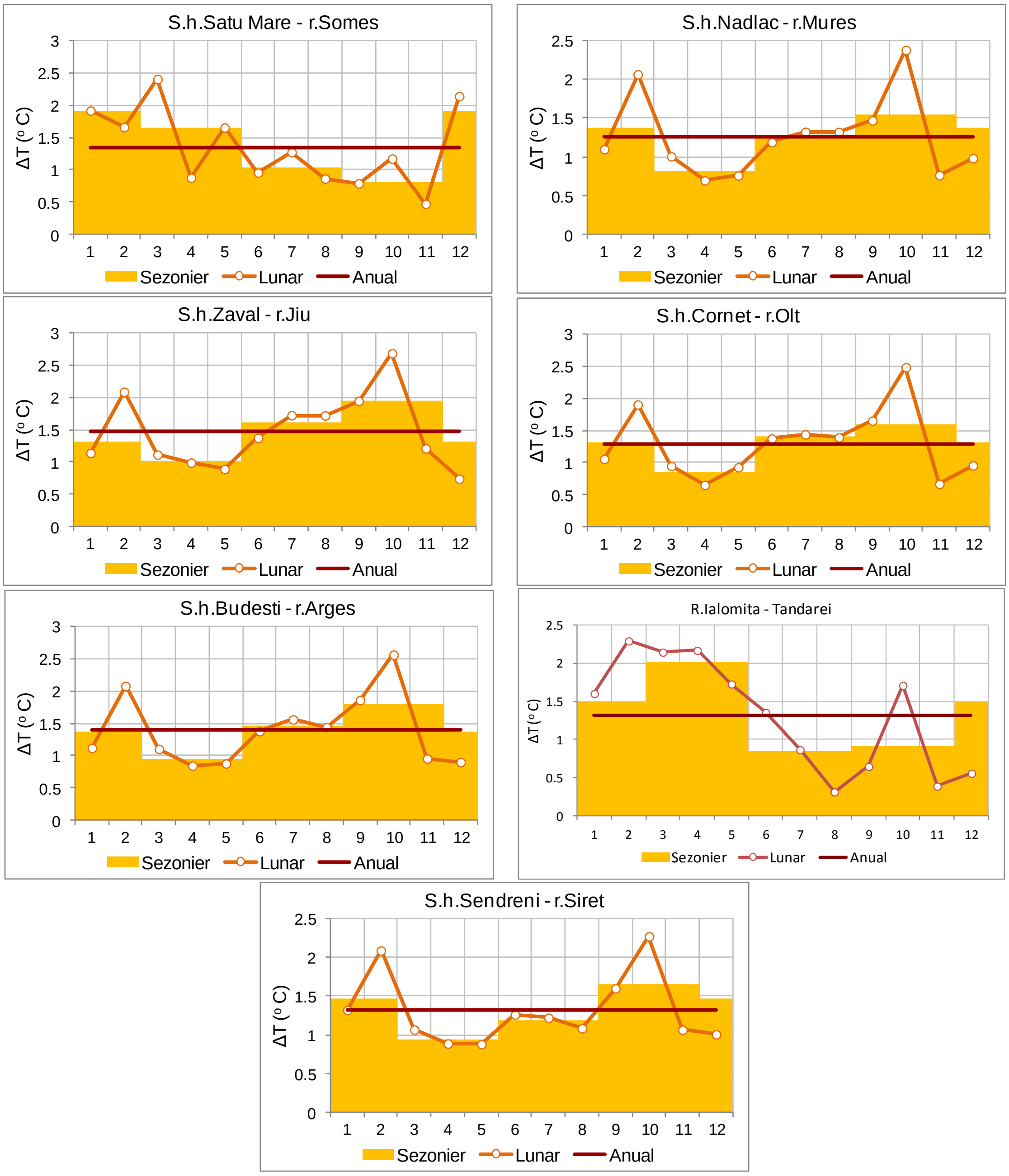


Figure 3. Monthly, seasonal and annual multiannual air temperature deviations (ΔT), from the 2021 – 2050 period, compared to the reference period 1971 – 2000, at the closing hydrometric stations from the analyzed river basins

Next, a comparative analysis of monthly, seasonal and annual multiannual average flow regime was performed for the two simulation periods, determining the relative deviation between them.

Figure 4 shows, the relative deviations of average monthly, seasonal and annual multiannual flows, from the period 2021-2050 compared to the reference period 1971-2000, at the closing hydrometric stations in the analyzed river basins, resulted from the simulations carried out with the applied hydrological models.

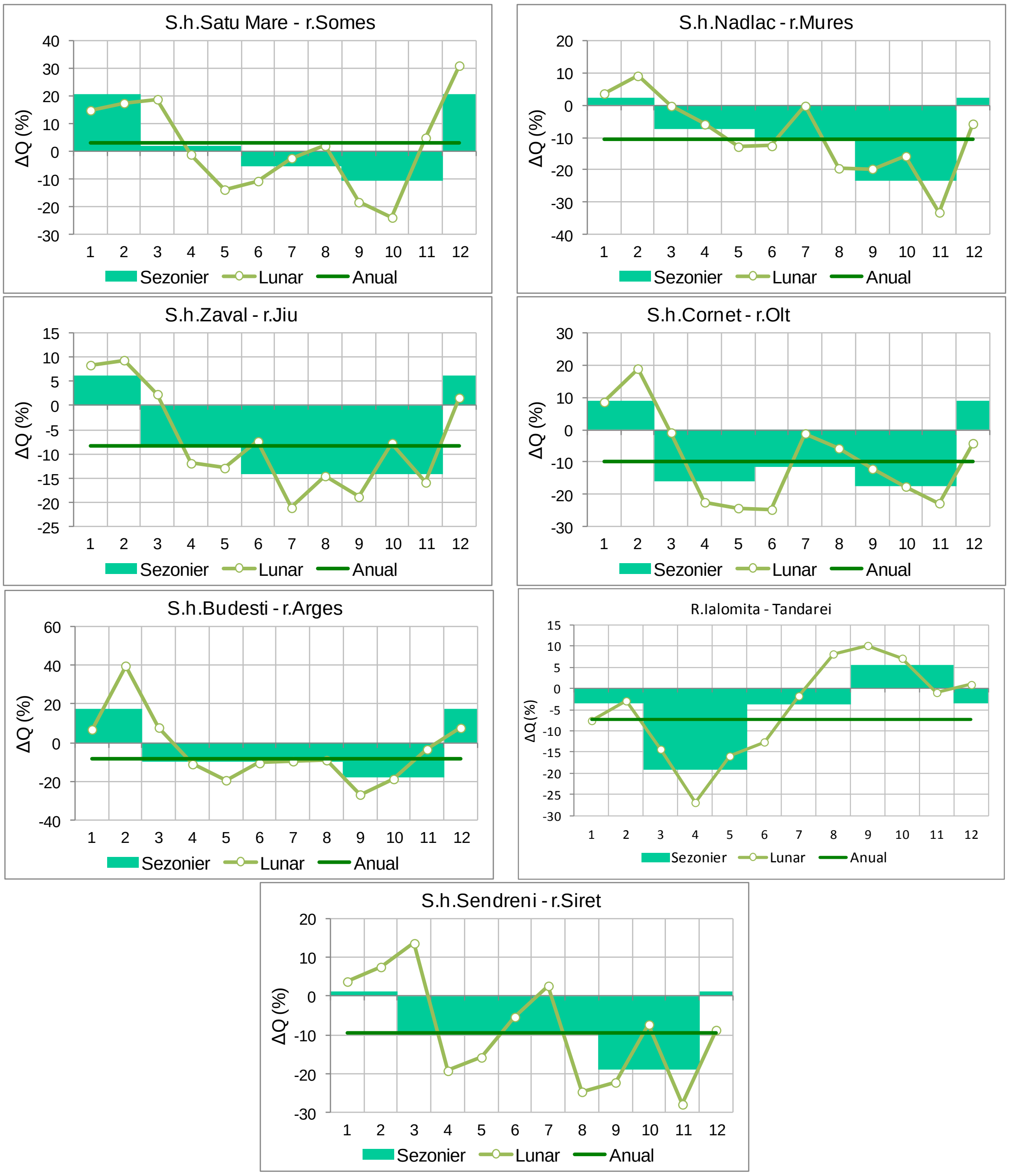


Figure 4. Relative deviations of monthly, seasonal and annual multiannual mean discharges (ΔQ), from the 2021 – 2050 period compared to the reference period 1971 – 2000, at the closing hydrometric stations from the analyzed river basins

The results of the study, after achieving the proposed objectives are:

- There have been obtained, for the reference period (1971-2000) and future period (2021-

2050), the mean monthly, seasonal and annual precipitation series on sub-basins in accordance with the calculation scheme of the hydrological model used for the analyzed river basins, through a series of pre-processing operations of the precipitation data used as input in the hydrological model.

- There have been obtained for the reference period and the future period, the monthly, seasonal and annual average temperature series on sub-basins, in accordance with the calculation scheme of the hydrological model used for the analyzed river basins, through a series of pre-processing operations of the precipitation data used as input in the hydrological model.
- There have been obtained for the reference period and for the future period, the monthly, seasonal and annual mean discharges, through a series of pre-processing operations of discharge data simulated with the hydrological model.
- There were comparatively analyzed, for the future period compared to the reference period, the precipitation and mean temperatures series on the sub-basins corresponding to the considered hydrometric station from the analyzed river basins.
- There were comparatively analyzed, for the future period compared to the reference period, the monthly, seasonal and annual multiannual mean discharges at the considered hydrometric stations from the analyzed river basins.

From the comparative analysis, for the future period (2021-2050) compared to the reference period (1971-2000), of the precipitation and average temperatures series on the sub-basins corresponding to the considered hydrometric stations from the analyzed river basins, resulted the following:

- The regime of monthly mean multiannual precipitation has an individualized general tendency on the 7 analyzed river basins, as follows: Somes: increase of 5.6% (between a minimum of 2.0% and a maximum of 12.2%); Mures: decrease of -5.0% (-8.0%; -2.9%); Jiu: decrease of -8.9% (-10.6% -7.2%); Olt: decrease of -5.3% (-8.9%; -2.2%); Arges: decrease of -4.7% (-6.0%; -2.4%); Ialomita: increase of 1.1% (-2.2%; 3.5%); Siret: decrease of -1.4% (-2.8%, 1.2%).
- In terms of mean monthly, multiannual air temperatures, there is an increase on the 7 analyzed river basins, as follows: Somes: 1.4 ° C; Mures: 1.3 ° C; Jiu: 1.5 ° C; Olt: 1.3 ° C; Arges: 1.4 ° C; Ialomita: 1.3 ° C; Siret: 1.3 ° C.

As a result of these variation trends in meteorological parameters, and the analysis of discharge evolution simulations, we can observe the following changes in the mean multiannual discharges:

- Somes: increaase of 6.2% (from -0.5% minimum value and a maximum value of 23.4%); Mures: decrease of -9.9% (-14.2% -6.9%); Jiu: decrease of -11.0% (-22.3% -3.8%); Olt: decrease of -9.5% (-14.4% -4.6%); Arges: decrease of -8.6% (-12.2%, -1.7%); Ialomita: decrease of -5.8% (-8.5%; -2.2%); Siret: decrease of -9.6% (-13.4%; -4.6%).

2.1.2. Hydrology of Extremes

Floods

Floods are among the most important weather-related loss events in Europe due to their large economic consequences, producing total losses of over 50 billion over the past decade (EEA, 2010). Extreme precipitation events and floods are frequent, and projected to increase, in many European countries, with a great concern in Eastern Europe - one of the existing flood hot spots (Vautard et al., 2014). Romania is considered sau ? recognized by World Health Organization (WHO, 2013) and the Romanian Catastrophe Insurance Scheme (PRAC) as highly exposed to natural disasters including earthquakes, floods and landslides. Among these threats, floods are dominant, in terms of frequency (e.g. the severe floods have in some areas, like plain landforms, low return periods of up to 10 years) and economic damage losses, having a great impact on human communities. According to the Natural Disaster Insurance Pool (PAID), the recent severe floods of 2005-2010 produced a total (direct) loss of more than 3 billion Euros in Romania, including 62,000 affected and 15,600 destroyed houses (www.paidromania.ro).

The paper aims to explore, collect and review the existing national and international inventories referring to major Romanian floods, in order to create a framework to support regional and local evaluation of floods exposure. This work will provide the baseline to better understand the patterns of socio-economic vulnerability to floods at various scales and of the adaptive capacity of living areas along the main rivers of this country. In this respect, 9 international databases were explored, documenting over 100 major flood events occurred in the last 50 years, aiming to extract the available key impact indicators of major historical flood events in Romania (e.g. losses, casualties, extend of affected area). This work is also in line with the joint initiative of the European Environment Agency (EEA) and Joint Research Centre (JRC), in collaboration with the Centre for Research on the Epidemiology of Disasters (CRED) and the European Topic Centre on Climate Change Impacts, Vulnerability and Adaptation (ETC-CCA), aimed to built an European Flood Impact Database.

The existing **international databases** on flood records make inventories mostly at global scale (e.g. EM-DAT International Disaster Database, Dartmouth Flood Observatory, GLIDE database, Global Disaster Alert and Coordination System), with various temporal coverage and include both spatial and statistical data. There are no common criteria in these databases in defining a major flood event, but the most typical entry criteria are related to the number of casualties and losses at national level. However, the EM-DAT International Disaster Database is the only dataset that uses a particular set of quantitative criteria for defining major floods, such events being considered only when fulfilling at least one of the minimum "disaster-threshold": ≥10 casualties, >100 affected persons; declaration of a state of humanitarian emergency, the need for international assistance.

The *EM-DAT* is one of the most comprehensive and detailed global disaster database covering 1900-to date period, with an extensive inventory of major flood recorded in Romania. The data related to consequences are provided from sources as United Nations agencies, NGOs, government communications, research institutions, earth observation data, etc. The natural disaster statistics for Romania rank the floods of June 2010 in Romania as the costliest from all past flood events, through a total economic damage cost of over 1 million US$x1,000 at national scale, followed by the floods of June 2005 (800,000 US$x1,000). The number of about 1,000 fatalities recorded during the floods of 1926, places these events as the deadliest disasters in Romania from all EM-DAT entries. However, this event was not found among the national records.

After 1950, the events producing the greatest number of casualties has been registered in May 1970, affecting the northern and central parts of Romania (215 victims), and in July 1991, in Siret River Basin, affecting especially Trotuş sub-basin, where the dam failure of the Belci reservoir caused most of the 108 recorded deaths. The effects of the exceptional floods of July 1975 are also well captured in the natural disaster country profile of EM-DAT, the event ranking the first in terms of the total number of affected people (about 1 million).

Detailed analysis of this database leads to the conclusion that after 1990, the information on the consequences of flooding is more transparent and complete, even the total loss associated to certain major events (e.g. 2006, 2008) is still missing (Fig. 1). The lack of such data explains the significantly lower total damage reported for Romania compared with other European countries with similar phenomena and exposure (Poland, Czech Republic, Slovakia, etc.). Also, the analysis of the floods consequences in Romania, but also in other EU Member States, highlights that, after 1990, there is a decreasing trend of events generating victims (especially those with more than 100 victims, typical for the 1970-1985 period).

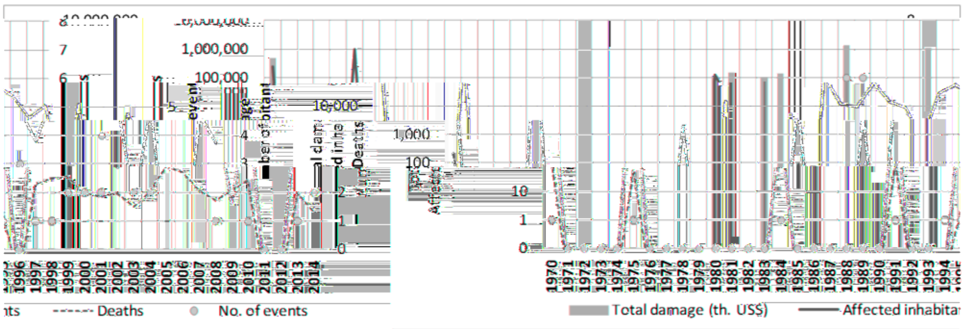


Figure 5. Number of flood events in Romania and main consequences included in EM-DAT database

The *Dartmouth Flood Observatory (DFO)* contains information about 40 flood events in Romania, derived from remote sensing sources, in-situ instrumental measurements, governmental communications, covering a 24-year period (1991-to date). According to DFO, the floods of 2005 rank the first in terms of economic losses and spatial extension of flooded areas.

Other disaster databases, with relevant floods data for Romania, mainly integrate core information from EM-DAT, CRED (Centre for Research on the Epidemiology of Disasters) and DFO, combined with other quantitative data from various sources: *Center for Refugee and Disaster Response* (CRDR); *Global Disaster Alert and Coordination System* (GDACS); *GLobal unique disaster IDEntifier Number* (GLIDE); *Global Risk Data Platform* (GRDP); *International Disaster Charter* (IDC); *Floods Portal of the Joint Research Center* (FP-JRC); *European Flood Alert System* (EFAS).

The list of past flood records in Romania as derived from the existing international inventories is large, totalling over 100 major events and comprehensive, comprising a great number of key-impact indicators. Table 1 synthesizes the main characteristics of the analyzed datasets (type, temporal coverage, available key impact indicators), as well as of the most important flood events affecting this country (e.g. human losses, economic damage, extent of flooded areas).

Table 1. ***Main characteristics of global disaster databases relevant for floods in Romania.***

Databases	Type*	Temporal coverage	Available key impact indicators and flood information
EM-DAT (www.emdat.be)	St	1900-to date	Number of killed and affected people, economic damage costs
DFO (www.dartmouth.edu/ ~floods/Archives/)	St-Sp	1985-to date	Flooded area location, flood duration, flood triggering factors, surface of flooded area, flood severity and magnitude, number of causalities and evacuees, damage costs, animations of flood events
CRDR (www.jhsph.edu/research/ centers-and-institutes/center-for-refugee-and-disaster-response/ natural_disasters/_Event_Floods.html)	St	1984-2009	Flooded area location, flood duration, surface of flooded area, number of causalities and displaced people, socio-economical characteristics of flooded areas
GDACS (www.gdacs.org/)	St	Real-time	Flooded area location, date and time of flood occurrence, surface of flooded area, number of affected people, warning thresholds of precipitation intensity
GLIDE (www.glidenumber.net/ glide/public/about.jsp)	St	1997-2010	Location of flood event, date and time of flood occurrence, surface of flooded area, number of affected people, flood event identification code
IDC (www.disasterscharter.org)	St-Sp	2000-to date	Location of flooded area, date of flood occurrence, the main land use type in the flooded areas, spatial distribution of pounding and flooding areas
GRDP (www.preview.grid.unep.ch/)	St-Sp	1999-to date	Assessment of mortality and economic risk from flooding, maps of flood frequency, population exposure to floods
FP-JRC (floods.jrc.ec.europa.eu/)	St-Sp	2010-to date	Daily warnings of critical hydrological levels and flood alerts for the main European rivers
EFAS (www.efas.eu)	St-Sp	2009-to date	Flood probability, hydrological (1-5 days and over 5 days) and meteorological (24-48 hours) forecasts for the main European rivers

*Type: St-statistical, Sp-spatial.

Besides the existing global multi-peril databases, several **database research projects** funded by the EU complement the existing flood inventories (e.g. PREEMPT, MEDIS, EMBRACE, CONHAZ, ENHANCE). Some of the main relevant examples, useful for flood research and mapping in Romania are FP6 HYDRATE project (2005-2008), which provides an archive of detailed data for a number of flash flood events recorded in Europe since 1994 and SEE Danube Floodrisk project, that developed a system of flood hazard and risk maps for the Danube River floodplains for different return period (10, 100 and 100 years).

Database created within the HYDRATE project *(Hydrometeorological data resources and technologies for effective flash floods forecasting)* is focused especially on triggering factors, hydrological features (Borga et al., 2011) and watershed characteristics. The main criteria for defining a flash-flood were duration of the storm event and maximum area of the catchment (Gaume et al., 2009 A number of 150 events occurred in Romania are included in this database (http://www.hydrate.tesaf.unipd.it/). In order to define a more relevant database for VULMIN project in terms of events with significant) consequences, some hydrological and geomorphic thresholds have been modified after a detailed analysis. Thus, only the floods characterized by a runoff more than 900 l/s/km^2 and a peak flow over the 10-year return period flow ($Q_{max} > Q_{10\%}$) were selected. With this filter, only 40 events have been maintained as proper flash-floods. Other significant events registered in recent years, after the project end, were added in order to be used for developing of the flood assessment methodology under the VULMIN Project (Figure 6) and were presented under the SciNetNatHaz Project.

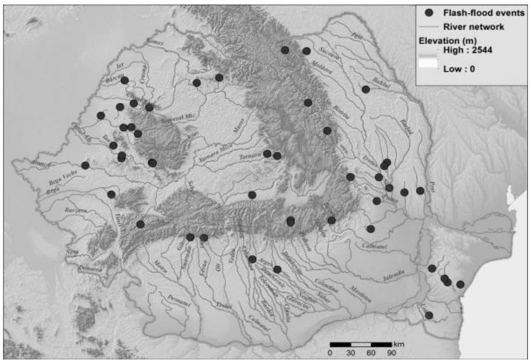


Figure 6. The location of significant flash-

Under EU Directive 2007/60/EC on the Assessment and Management of Flood Risks (known as "Floods Directive"), the first stage, prior to hazard and risk mapping, consisted of a preliminary flood risk assessment, which involved the identification of significant historical events (both in terms of the phenomenon severity and the caused damage) and delimitation of areas with significant potential flood risk. The specific requirements refer to the mapping of the areas or river sectors affected by historical floods and their consequences on human health, environment, cultural heritage and economic activity.

The selection of significant historical floods in Romania was performed by applying the own country's criteria, established by specialists from NIHWM. Hydrological criteria focused on the selection of historical events, with an occurrence probability of less than 10%, or with streamflow over the one corresponding to the flood level affecting large areas. In terms of consequences, a number of thresholds have been established referring to: the number of fatalities, affected social, infrastructure and economic objectives (e.g. schools, hospitals, roads, factories), damaged or destroyed houses, units under the EU Directive on Integrated Pollution Prevention and Control (IPPC), etc.

A number of 36 significant historical floods at national, basin or local level, have been identified for the inland water courses, and other 3 events for the Danube. The largest events were those of May 1970 (Someş-Tisa, Mureş and Siret), July 1975 (Mureş, Olt and Argeş-Vedea), July 2005 (Olt, Argeş-Vedea, Buzău-Ialomiţa and Siret) and June 2010 (Fig. 3). Also, certain local severe floods that occurred on small areas have been added to the reporting. Their low occurrence probability and high magnitude of damage implied their classification as local significant historical floods (e.g. flash-floods or hydraulic structures failure) (Table 2).

The structure of Flood Directive Database imposed the segmentation of major events at the level of watercourses (rivers and main tributaries), resulting 380 different events (http://www.rowater.ro/EPRI/EPRI.aspx).

Someş-Tisa	Crişuri	Mureş	Banat	Jiu	Olt	Argeş-Vedea	Buzău-Ialomiţa	Siret	Prut-Bârlad	Dobrogea-Litoral	Danube
1970 / 05		1970 / 05						1970 / 05			
						1970 / 07					
		1975 /07			1975 /07	1975 /07					
	1980 / 07										
									1985 / 06		
								1991 / 07*			
	1995 / 12										
	1997 / 06										
											1998 / 01
		1998 / 06									
				1999 / 07			1999 / 06				
	2000 / 04		2000 / 04								
2001 / 03											
			2005 / 04								
					2005 / 07	2005 / 07	2005 / 07	2005 / 07			
		2005 / 08									
						2005 / 09.	2005 / 09			2005 / 09.	
2006 / 06								2006 / 06			2006 / 04
									2007 / 09.		
2008 / 07								2008 / 07	2008 / 07		
								2010 / 06	2010 / 06		2010 / 06

National or basin level   Local level   * both national and one local flood

Figure 7. *Significant historical floods in Romania (year and month of occurrence) selected for each River Basin Administration*

Table 2. ***Local floods reported in the framework of Flood Directive***

River Basin Administration	River/Event	Date	Frequency
Someş-Tisa	Ilişua	June 2006	3%
Mureş	Feernic	August 2005	1%
Crişuri	Barcau	June 1997	10%
Buzău-Ialomiţa	Comisoaia - loc. Cuculeasa	June 1999	1%
Siret	Tazlău –Belci dam failure	July 1991	0.1%
	Arbore	June 2006	0.1%
Prut Bârlad	Tecucel	September 2007	0.5%
Dobrogea Litoral	Costineşti	September 2005	0.2%

The design of flood database developed for Romanian events

Development of a database regarding the inventory of floods and of a spatial data portal should be an optimal combination between scientific content, practical utility and data collection possibilities. Also, a well defined connection should be between the attribute and GIS (geospatial) data in terms of the level of database structure and encodings relevance (Figure 8).

Analysis of the previously mentioned databases, especially those available from Floods Directive (Maidens and Wolstrup, 2013), HYDRATE project and EM-DAT, Danube Floodrisk, (Adler et all 2012, 2013), has led to the proposal of a database structure for historical events, mainly for future events that might become historical at a given moment (e.g. for the next reporting of the Flood Directive).

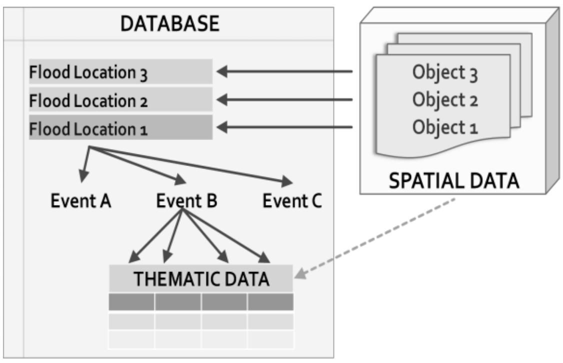


Figure 8. The link between database and GIS ***data.***

This structure is comprehensive, being usable primarily at national level, which could provide also the requested information at European level (Figure 9).

Most of the data included in the proposed database are common to both types of phenomena, floods and flash-floods. Only those related to the physical-geographical indicators of watershed are specific to flash-floods, deriving from their particular characteristics and mechanisms of flooding.

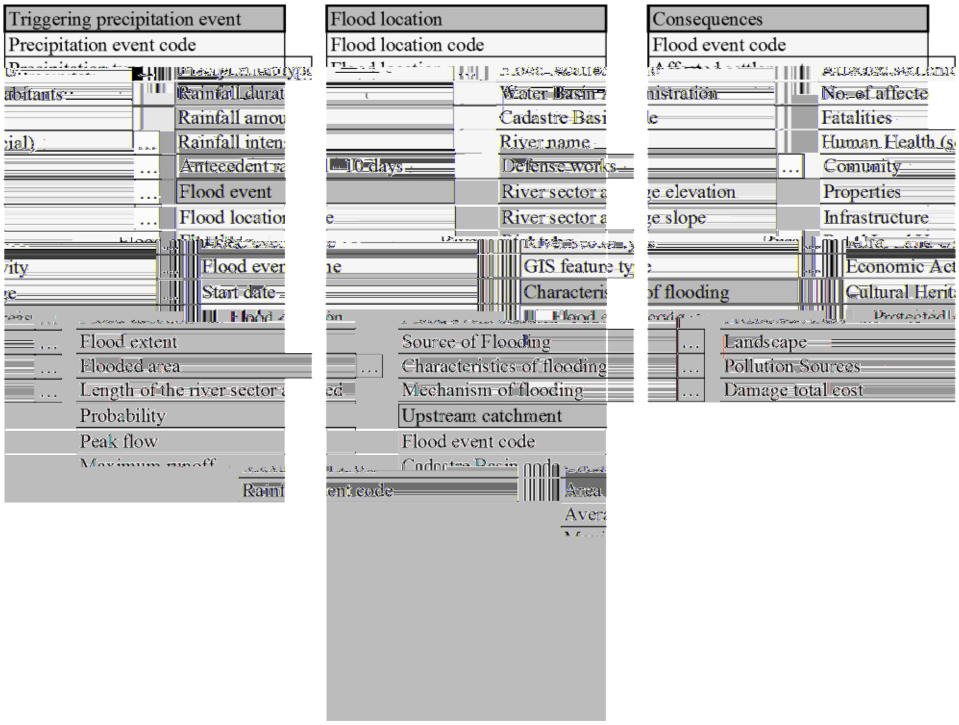


Figure 9. Data and information types included in the floods database in Romania

Romania is a flood hotspot in Europe, which experienced significant human and economic losses in the last decade (e.g. 2005, 2010). The global multi-peril databases surveyed, provided a relatively large amount of information about some of the exceptional past flood events in Romania, making the effects of these events public, and representing a valuable interdisciplinary tool in assessing the population exposure as a step towards the assessment of socio-economic vulnerability to floods. However, the available quantitative data must be handled with caution and prudence, when considering the primary flood information sources, both official and unofficial. In a few cases, the flood monetary damage could be considered reliable. The damage amount is still missing for some major past flood events (e.g. 2006, 2008). The total damage produced by past major flood events occurred during the communist period (e.g. 1970, 1975) is rather underestimated, while for some events registered after 1990 (e.g. 2010), overestimated. In the available databases, there is not an easy distinction between the two types of floods, certain differences existing in terms of triggering factors, flood location features, etc. This aspect leads to some difficulties in the designation of a homogeneous database.

Considering the scientific and flood reporting needs, but also the availability of reliable information about floods (including slow floods and flash-floods), the main attributes of these events have been included into the database of Romanian hystorical events. The database could be a useful tool for more detailed analyses, including future hydrological changes connected to climate change (Adler et all, 2013, 2014, Chendes et all, 2014, 2013, Corbus et all, 2013, 2014, Mic et all, 2013, 2014, 2015).

Drought

In Romania, researchers from National Institute of Hydrology and Water Management (NIHWM) collaborated with the working group on “Low flow indices” of the European FRIEND – Water Low flow and Drought group in order to prepare a larger publication on current low flow conditions across Europe. The research work consisted in computation of low-flow indices based on aforementioned software package.

Better knowledge of the river system, under a changing environment conducted for rearch of the frcquency of the river drying during different period of time and climatic conditions. Between 2013 and 2015, the intermittent water courses, for different period of times were inventoried, in order to identify the areas prone to dry up, i.e. with water deficit. This activity is of utmost importance for the implementation of an adequate water management plan and for the sizing of hydro-technical constructions – figure 10.

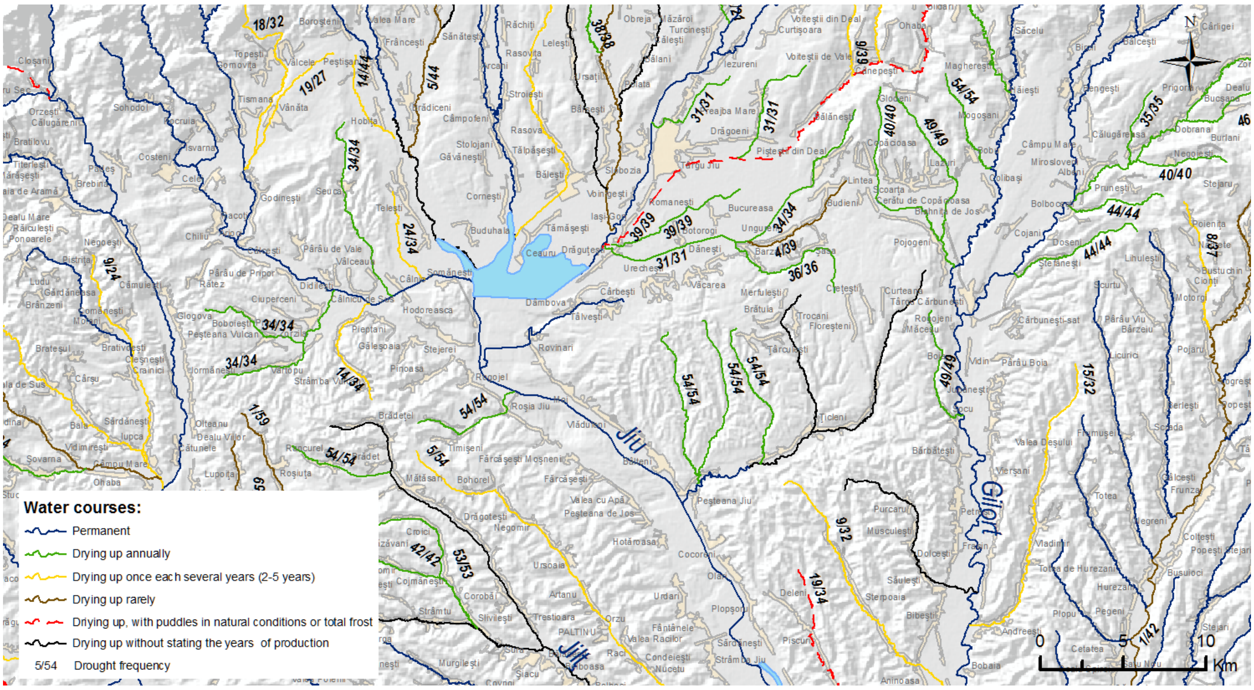


Figure 10. Processed information (through GIS environment) concerning the non-permanent character of water courses and the frequency of the drying up phenomenon. Aspect from Jiu catchment area.

Also, the statistical approaches and methods for low flow assessment constitute a priority in the development of research topics at National Institute of Hydrology and Water Management from Romania. Such local basin studies identified low flows and drought mechanism at a local scale, with anthopogenic influences and water scarcity phenomena (CLIMHYDEX Project). Based on the multi-scalar drought indices, *Chelcea & Adler (2013)* have highlighted the dry periods from a hydrological point of view on the Barlad River from Romania applying the theory underlying the calculation of standardized precipitation index *(SPI)* to define a standardized flow index *(SFI)*. The results showed that the highest variability between SFI and SPI is identified for the summer season, where the response time between hydrological and meteorological drought at different time scales is up to 3 months. On the annual time scale, the response time is at least 6 months on the Barlad river.

Cooperation research at the **Danube Basin** gave a larger imagine of the regional behaviour of drought phenomena. Based on the obtained results following the use of this software package, also were computed the low-flow indices for the "*Guidebook for the management of low flows in the flood plain of the Danube River. Case study in Romania - Estimation of drought indices and low flow for the Danube River*" (Chelcea and Adler, 2014). In low-flow assessment, this statistical approach and methods can certainly be a comprehensive and essential analysis. The aim of this research work is to select the most suitable indicators for the low-flow and the hydrological drought. Based on the calculation of these indicators, an assessment of the thresholds in the evolution of the streamflow for the Danube River, on the Romanian - Bulgarian common sector (Gruia - Chiciu-Calarasi) of this phase of the lacking hydrological regime, was achieved; some conclusions could be enphasized:

- Based on the calculation and statistical analysis of these indicators an assessment of the thresholds in the evolution of the streamflow on the Danube River, on the Romanian-

Bulgarian common sector (Gruia - Chiciu-Calarasi) of this phase of the lacking hydrological regime, was achieved.

- Following the analysis of the minimum number of consecutive days (10 and 30 days) with days without precipitation, one may consider that the dry periods are displayed with different frequencies and intensities from one year to another for each hydrometric station. In the meantime one may say that the south of the Romanian Plain, nearby the Danube river (the section corresponding to the Romanian - Bulgarian border) emphasize a high vulnerability regarding to drought phenomenon.
- In the case of the standardized anomalies of the mean air temperature an increasing trend is observed for the analyzed period (1943 – 2011). In generally, the period 1953 – 1997 was characterized by negative temperature anomalies, while the period after the beginning of the 1990's is characterized by strong positive anomalies (values of mean annual air temperatures were higher than multiannual mean air temperature value).
- Regarding to dry periods from hydrological point of view, values of water discharges selected from those smaller than $Q_{monthly\ minimum\ 80\%}$ occurred during last decades (1983, 1985, 1990, 1992, 2003, 2007, 2009), especially during the Summer - Autumn period. Their continuous occurrence duration were smaller than 15 days, insufficient to consider them dry periods in this time interval.
- In order to note the deficites that affect the different sources used in water and to distinguish different types of drought, multi-scalar drought indices (SPI, SPEI and SFI) are used. Both in case of the SPI index and the SPEI once, it is recorded the same dry years periods, but the values of SPEI index are smaller than the ones of SPI, especially in the extreme dry periods. This is the result of the lower level of variability of the air temperature and the evapotranspiration, versus the precipitations. The annual values trend shows a positive evolution for the whole analyzed period.
- The hydrological drought (SFI index) periods are clearly highlighted: moderate (-1.5 ÷ -1), severe (-2 ÷ -1.5) and extreme (≤ -2), but also periods of time with high discharges. In this way, the periods characterized by the hydrological drought have been recorded for the years: 1946, 1947, 1949, 1950, 1952, 1953 – 1954, 1964, 1972, 1974, 1983, 1987, 1989, 1990, 1993, 1994 - 1995, 2003, 2007 and 2011. The trend shows a positive evolution for the whole analyzed period. For the early period droughts prevail on a wider range of years (1946 - 1954) and at the end of the observation interval wet periods are also prevailing (2005 - 2010). The trend is significant just only in case of climatic indices, for the observed period.
- Regarding to seasonal evolution of indices, in summer, dry periods are identified for the years 1990, 1993, 2003 and 2007, while for the autumn season dry periods are identified for the years 1990, 1993, and 2003. The SFI index values that characterize extreme drought (≤ -2) are identified for the year 1990 (for SFI9), in summer and autumn, respectively, and for the year 2003 (for SFI6), in autumn. To conclude, are identified the same dry periods with the highest values for the year 1990, in summer and autumn, respectively, and for the year 2003, in autumn.
- Dry periods (SFI3 values ≤ -1) established on this index are represented in diagrams for stations on the Danube river. In these diagrams are highlighted through different colors for three types of drought (classes) corresponding calendar months: moderate drought ( ) (-1.00÷-1.49), severe drought ( ) (-1.50÷-1.99) and extreme drought ( ) (≤ -2.00). In these diagrams can easily be noticed long periods with consecutive months in which there have been various types of hydrological drought (moderate, severe and/or extreme). There are emphasized the dry periods longer than two consecutive months in the first part of the interval, as following: 1942 - 1954, 1971 - 1972 (a period of nine consecutive dry months with different intensities), 1989 - 1994, 2003, 2007 and 2011.
- From the computation of the frequency based on drought classes for SFI3 at Corabia and Chiciu - Calarasi stations, for the months June – November for the period 1942 – 2011, it is observed that the frequency of moderate and severe drought is generally higher than the

frequency of extreme drought, for the analyzed months, at both stations. The severe drought periods have a higher frequency in the months of June and July, and in October too, at Corabia station. On the other hand, the moderate drought periods occur with a greater frequency in November at both stations. The months in which extreme drought frequency is the highest, are August and September, at both stations, but October too, in the case of Chiciu - Calarasi station.

- Using the information relative to the probability of a drought event of a given magnitude (moderate, severe or extreme), which occurs on average one time each T years, in the summer, the moderate drought can occur with a probability of 91%, once in 35 years, and the severe drought, with a probability of 90% in the same period for Danube river. But, in the autumn, within 20 years, the probability of moderate drought occurrence is 93%. Within 35 years, the severe drought can occur with a probability of 62%, and the extreme drought has a very low probability of occurrence of 38%, in the same time. In conclusion, the range in which can occur moderate drought is shorter in the autumn than in summer. On the other hand, the range for which has been computed the probability of severe drought is lower in the summer than in the autumn.
- Regarding to low flow indices, an estimation was made for the Danube river at three hydrometric stations, based on the software package *lfstat*. It was computed a set of indices which are illustrated with hydrographs for different periods, base flow visualization, flow duration curve, recession diagnostics, flexible streamflow deficit plots and characteristics of each low flow period (dry spell), including duration, deficit volume, drought magnitude, minimum flow, and start date (hyear, month, day). From an analysis of temporal variation of base flow for the Danube river at Chiciu - Calarasi station, are distinguished three years with low variation of base flow: 1950, 1972 and 1990 (values are between 2000 and 6000 mc/s).
- Hydrological regime of Danube River at Chiciu - Calarasi station shows a low-flow season in the autumn months from August to October.
- The mean annual minimum n-day discharge MAM (n-day) was computed for Corabia, Giurgiu and Calarasi stations on the Danube river. The evolution and the moving average of MAM (1-, 7, and 30-days) for these stations shows a lower variability and negative anomalies in the intervals 1941 – 1954 and 1984 – 1994.
- The characteristics of low flow period (dry spell) from 2011 and 2012 years for the Danube river at Chiciu – Călărași station, was made. The year with the longest duration of dry spells is 2011, with a total number of 199 days. Also, the longest low-flow spell is 120 days.
- In low-flow assessment, this statistical approaches and methods can certainly be a comprehensive and essential analysis. Therefore, both of the drought indices and low flow may constitute a starting point to elaborate good quality studies for low flow management and drought prevention, i.e. guidelines for the management of low flow and drought prevention.

Seasonal studies were also of interest, looking for the evolution of drought indexes and their regionalization. In such reserch (Ionita et all, 2014) was examined the spatial and temporal variability of winter (DJF) streamflow over Romania recorded at 46 hydrological stations over the period 1935 -2010. An empirical orthogonal function analysis (EOFs) was employed to characterize the spatial variability of winter streamflow. The dominant mode captures in-phase variability of river flow anomalies over the entire country. The second mode is characterized by a north-south dipole, emphasizing the influence of topography over the streamflow variability. Both modes are related with large scale atmospheric circulation and sea surface temperature patterns. We show that the Arctic/North Atlantic Oscillation, East Atlantic, East Atlantic/Western Russia and Scandinavian patterns control a significant part of the interannual winter streamflow variability as captured by these two modes. Moreover, the SST anomalies from the Atlantic Ocean realm play also a significant role on the variability of winter streamflow over Romania – figure 11.

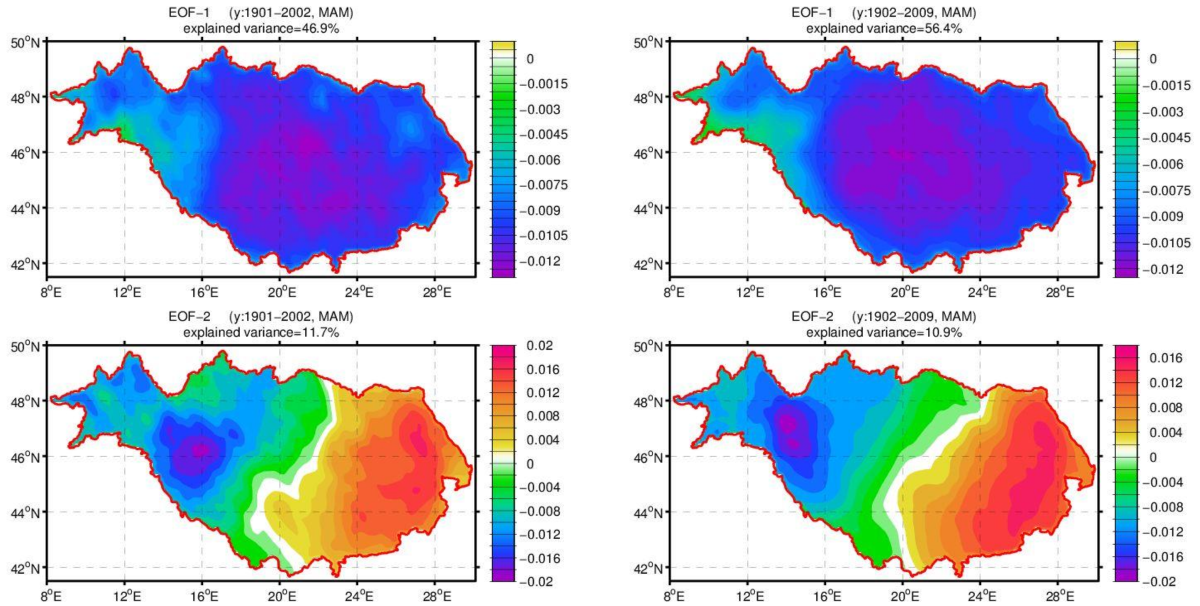


Figure 11. EOF analysis (scPDSI vs. SPEI12)

In conclusion, it was shown that the streamflow variability over Romania is strongly related to large-scale atmospheric patterns and global SST and this kind of analysis can be useful to connect long-term hydrological variability to climate forcings. A next logical step will be to perform the same analysis for the other seasons and indentify possible resemblances or differences in the large scale atmospheric patterns responsible for streamflow.

2.2.3. Small scale research in experimental basins

In order to know the characteristics of the runoff in the small river basins with an up to 150 km^2 surface, in Romania there are 15 representative basins and 2 experimental basins located in all the physic – geographical areas of the country (figure 12).

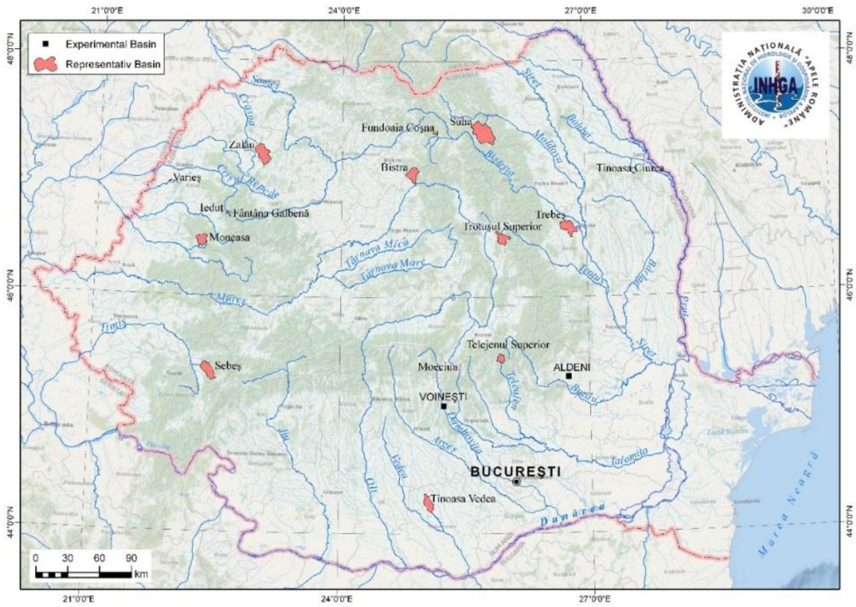


Figure 12. Network of representative and experimental basins in Romania

The main objectives of the researches in Representative Basins are carried out for:

- ✓ Water and suspended load discharges (figure 13), liquid and solid precipitation as well as air and water temperature, wind speed, relative humidity, Sunshine duration,
- ✓ Measurements for the level of the ground waters;

- ✓ Soil moisture and temperature, evapotranspiration, global radiation;
- ✓ Determination of the infiltration speed of the water into the soil by using the artificial rain installations, for the determinations of the flow speed of the water into the bed or of the determination of the evolution of the snow cover characteristics.

Figure 13. Area accentuated erosion in Tinoasa-Ciurea R.B.

The data accumulated in the representative basins are systematized in the form of year books including a multitude of hydrological data referring to the characteristics of the liquid and solid flow and the above mentioned meteorological data in form of tables and graphs (figure 14).

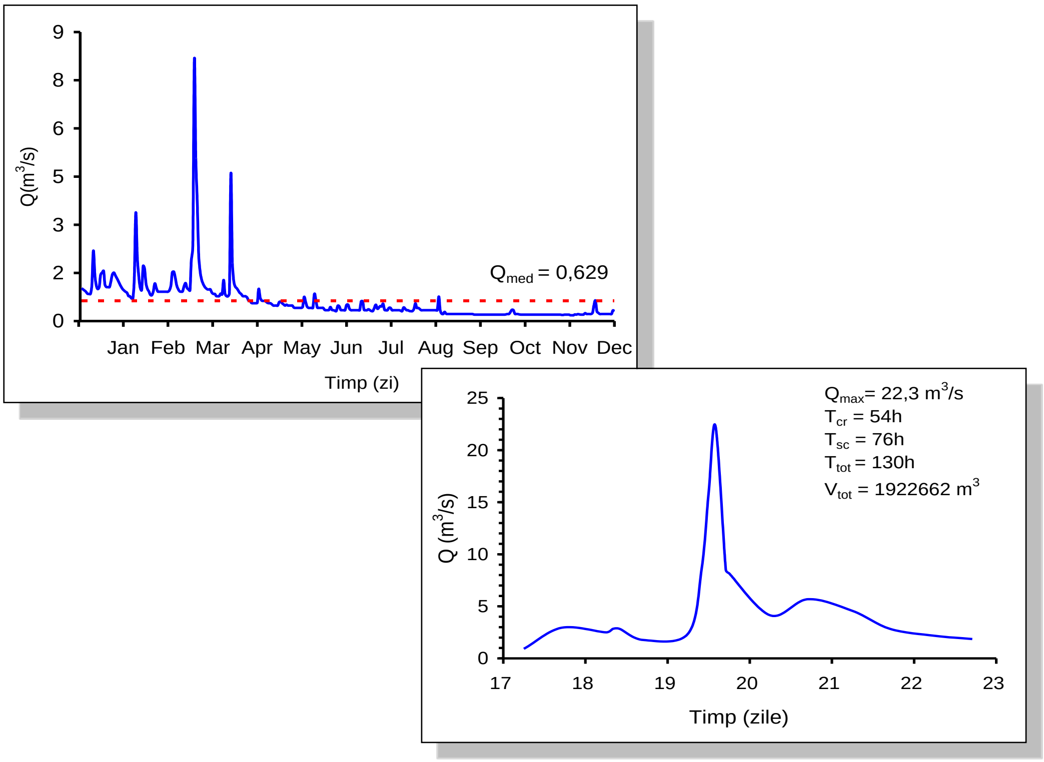


Figure 14 The hydrograph of medium day liquid discharge from 2011 and the flood wave of 17 - 22.III.2011 from Zalău River, Borla s.h.

Experimental hydrological research with experimental plots, in correlation with complex programs of observations and measurements, is conducted at 2 research units. The content of its activity concerns the establishment of quantitatively defined relationships of runoff and genetic and conditional factors. These basins are situated in the Curvature Subcarpathians (Fig. 1). The hydrologic activity started around 1964, with the founding of the Station for the Experimental Hydrology of Voineşti, now called Voineşti Experimental Basin, and since 1980 to Aldeni. Within the Aldeni Experimental Basin and Voineşti Experimental Basin, the micro-scale study of hydrological components of the water budget is conducted with an observation equipment that allows an estimation of the physiographic influences in the region (geomorphic, climatic, soil) and anthropogenic intervention - land reclamation.

Voineşti Experimental Basin (Figure 15) was created to establish relations between runoff and its genetic and conditional factors, to design rainfall-runoff mathematical models, to quantify the way different topographical and cultivated surfaces participate in the flow processes and to study the water balance in the soil.

Studies in the Aldeni Experimental Basin are part of the hydrologic comprehensive research initiated in 1980. In the same year, the first field explorations were conducted and between 1981 and 1984, in collaboration with the present-day University of Agronomic Sciences and Veterinary Medicine of Bucharest, soil improvement activities were initiated (terracing, artificial rill and orchard planting), in order to assess, finalize and certify the basin. Anthropogenetic interventions conducted by AEB in the area allowed the determination of the values of water and suspended load discharges in a modified regime.

a) Experimental plots in Voinesti Experimental Basin and b) the hydrometeorological equipment from artificial rainfall

2.2.4. Modelling the river system and forecasting platform in Romania

The DELFT-FEWS is actively developed and maintained by DELTARES, Netherlands, following a community approach. There is no license fee for using DELFT-FEWS platform in operational hydrological forecasting and warning systems, there are only support costs, on a consulting basis for training, configuration and/or customization, services which could be provided by several companies.

The Delft-FEWS platform integrates the Danubius hydrological model, Mike11 hydrodynamic model, Mike 11 AD model and the HEC-RAS model.

The input data, water discharges and water levels, is taken automatically from the DESWAT database and used in the platform for the hydrological modelling and data displaying.

Afterwards the output of the hydrological model at Gruia station is used as input for the hydrodynamic models, which conveys the simulated discharge downstream with the main objective of obtaining a more accurate view of the water level variation across the river sector.

The Mike11 AD model result is the evolution of the pollutants concentrations in space and time along the river.

In **Error! Reference source not found.**6 could be seen the map overview of the implemented FEWS platform. In 17 and 18 are presented the selectors that help us to filter the input and output data of the platform.

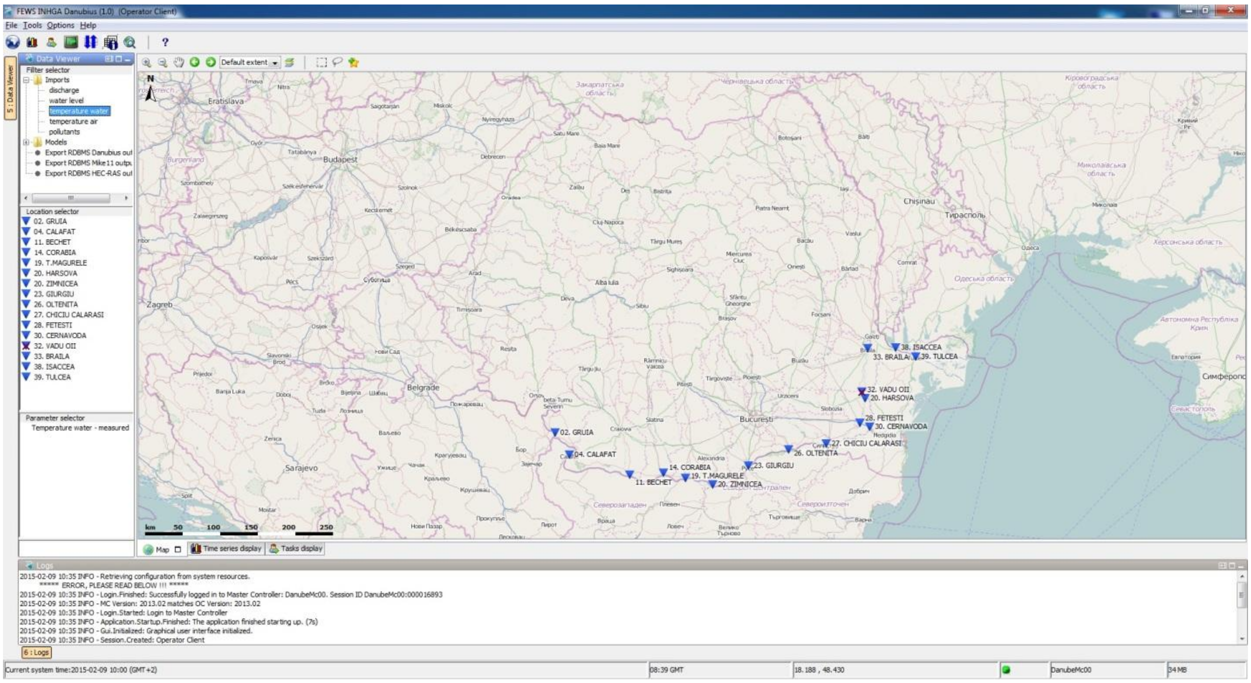


Figure 16 Global view of the grapghical use interface of the platform

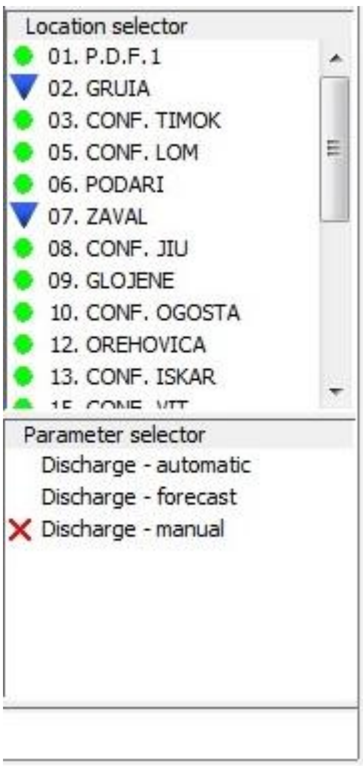


Figure 17 Location selector window

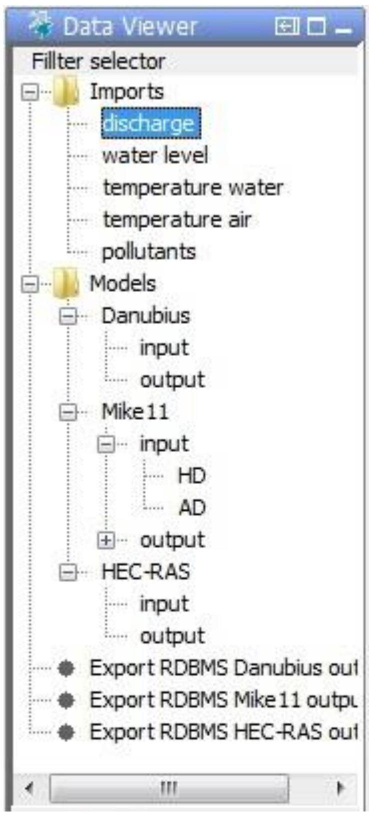


Figure 18 Filter selector window

The cross sections are used for hourly data input are presented in Figure 19, and an example of the hidrographs from the automate stations are presented in figure 20.

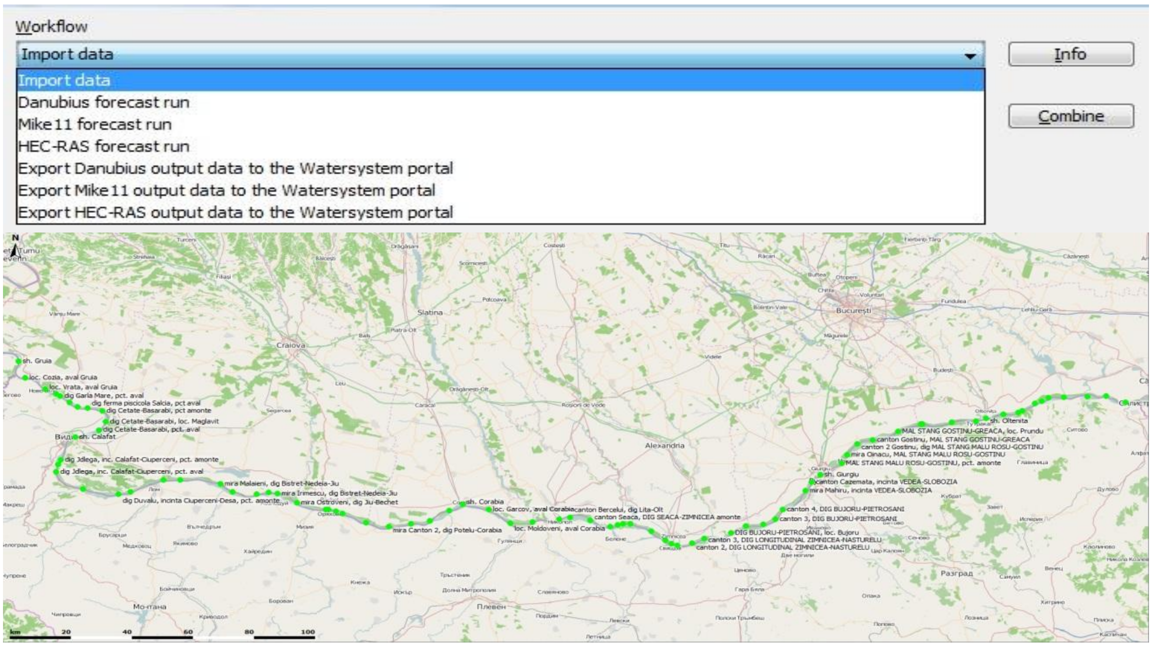


Figure 19. cross sections for foreasting

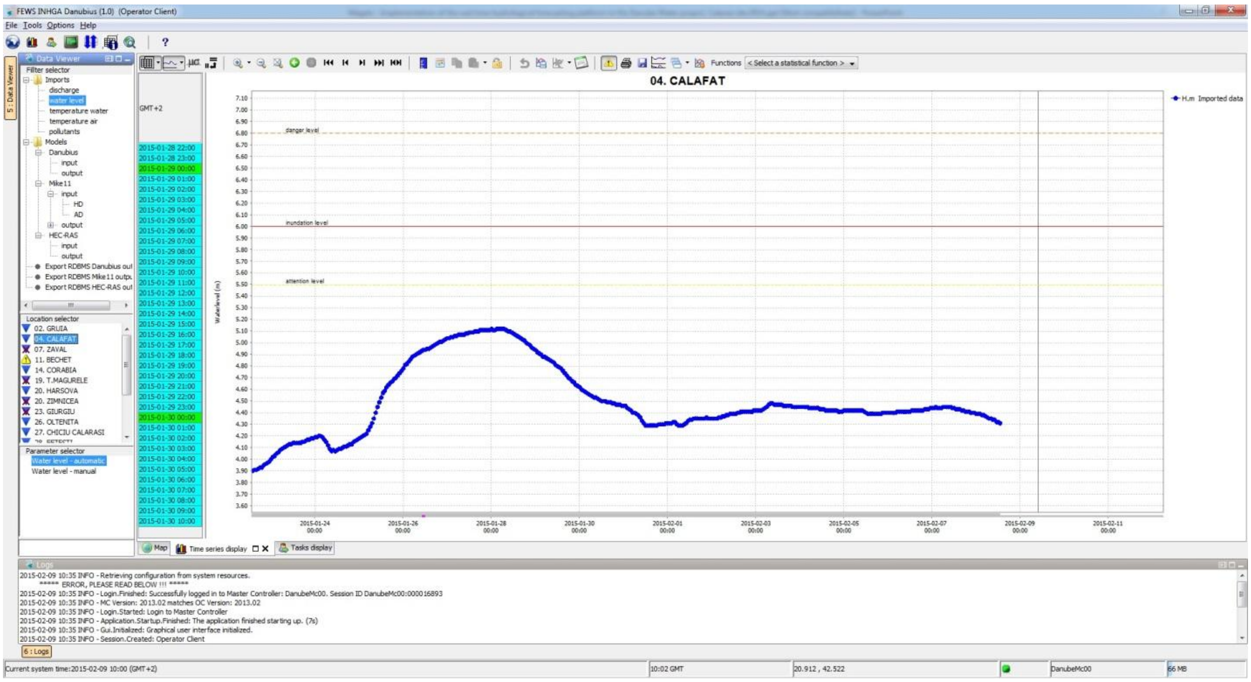


Figure 20. View of the water hydrographs at Calafat station

The data flow in the forecasting platform is presented in figure 21; models are used under the platfor for a multi-models results optimization are MIKE, HEC-RAS and Danubius; the last one is a Romania model developed by INHGA researchers. The hydrological models are coupled with dispersion model.

The platform is a client server system, offering possibility for a direct access of multiple operators – figure 23.

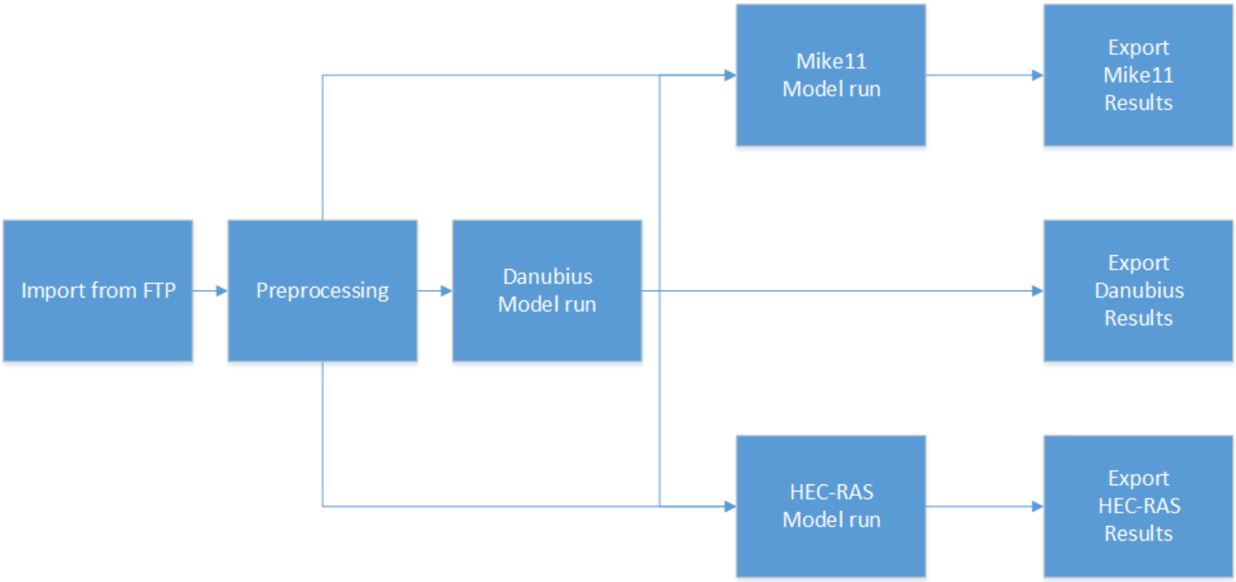


Figure 21 Data flow

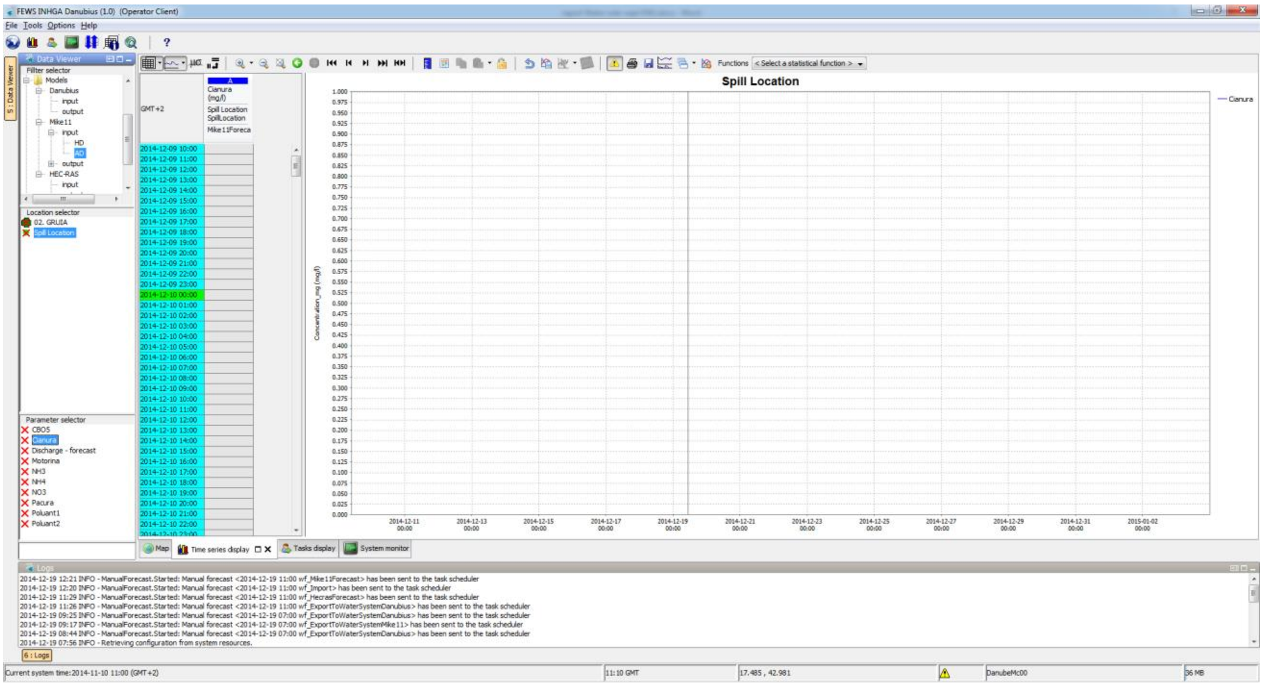


Figure 22. Print screen of the pollutants parameter selector from the FEWS platform

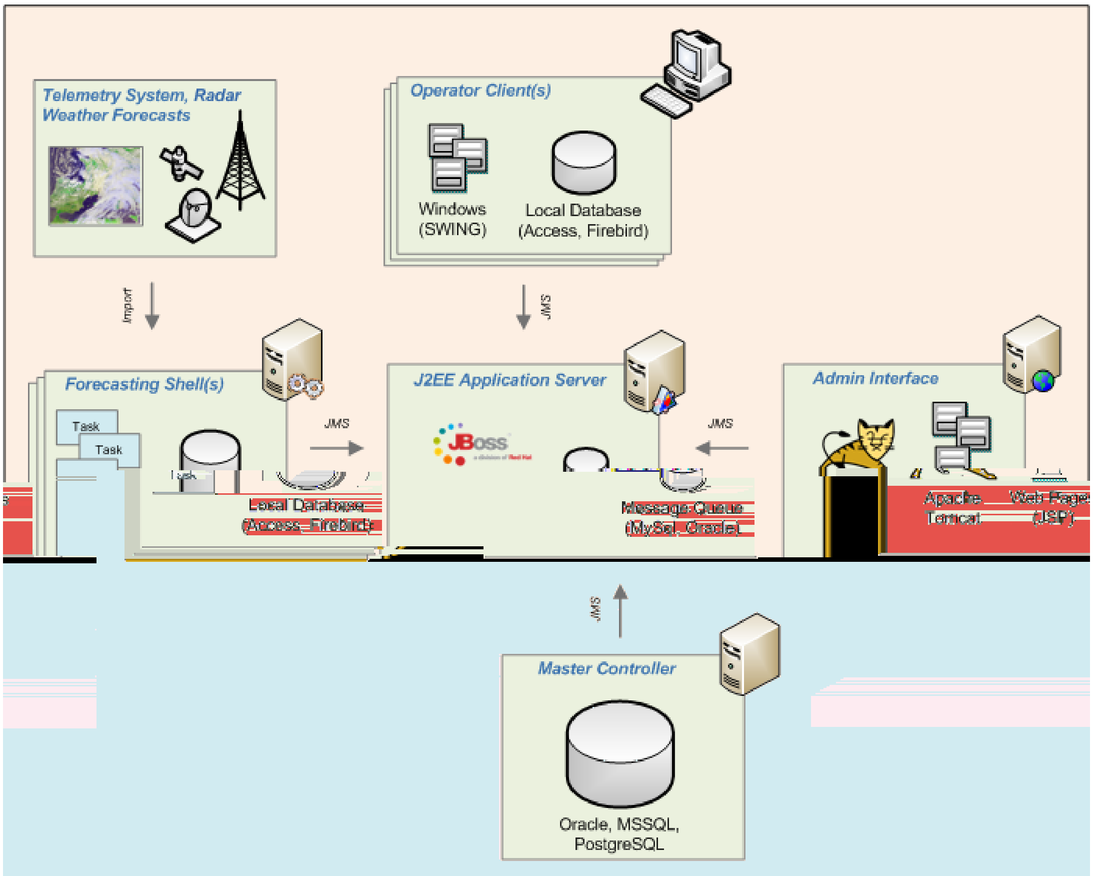


Figure 23. FEWS Client-Server system

2.2.4. Ecohydrology

The National Institute of Hydrology and Water Management – NIHWM performs studies in ecohydrology domain. The main research topics are river restoration and environmental flows. These topics are challenges for Europe scientific community and key-issues for implementing Water Framework Directive. The river restoration and environmental flows implementation are measures that should be taken aiming at achieving good ecological status (the main objective of WFD). Within NIHWM, the topics are tackled adopting a multi-disciplinary approach: biologist, chemist and engineer working together.

Some solutions proposed to improve river continuity (longitudinal and lateral connectivity) are the outcome of the research activities.

A methodology for assessing the environmental flows is currently under development relying on the recommendations of CIS Guidance Document no 31 - Ecological flows in the implementation of the Water Framework Directive. The methodology should cover the diverse features of the water bodies through out Romania.

2.3. Groundwaters research in Romania

ICGW is responsible for the advancement of the science of groundwater hydrology, including the scientific basis for groundwater resource assessment and groundwater management according to the Water Frame Directive (2000/60/EC) and Groundwater Directive (2006/118/EC).

Considering this, in the period 2011-2015 activities related to groundwater study in Romania have been directed mainly towards research directions that support the implementation of these EU Directives, while taking into account the reporting requirements of the European Commission, ICPDR and the European Commission Management Plans (WISE system).

Among these activities are:

- Establish a procedure for assessing the quality status (chemical) of groundwater bodies and assessment of quality for bodies of groundwater in Romania in 2015 – fifure 24.

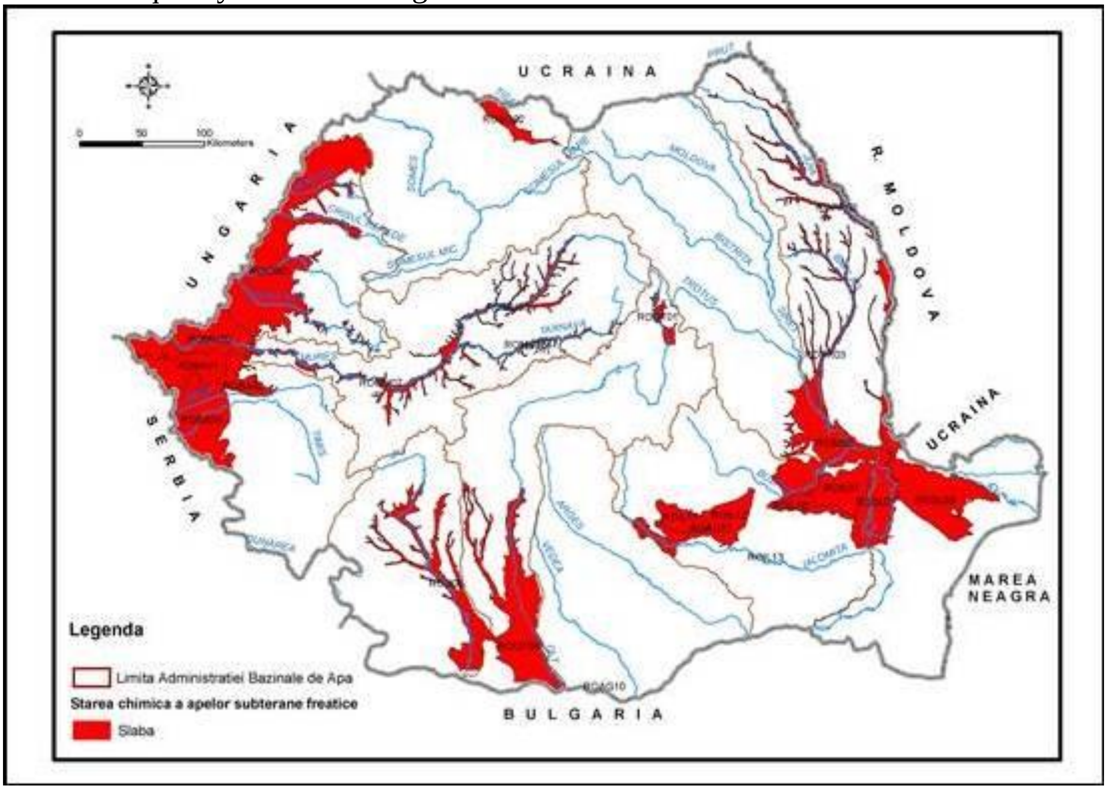


Figure 24. Condition of the groundwater quality status in Romania - 2010

- Reporting to the International Commission for Protection of the Danube River (ICPDR) Vienna the groundwater quality data for the cross-border groundwater bodies with bilateral agreements.
- Develop procedures for sampling and chemical analysis of water in situ probe and for multiparameter analysis;
- Identification of significant and sustained upward trends in concentrations of pollutants, groups of pollutants or indicators of pollution in groundwater bodies identified as being in poor chemical status.
- Identify potential flooding risk areas by underground seepage phenomenon based on data recorded in shallow wells from the National Hydrogeological Network, correlated with information contained in the map of land affected by excess moisture in Romania – figure 25.

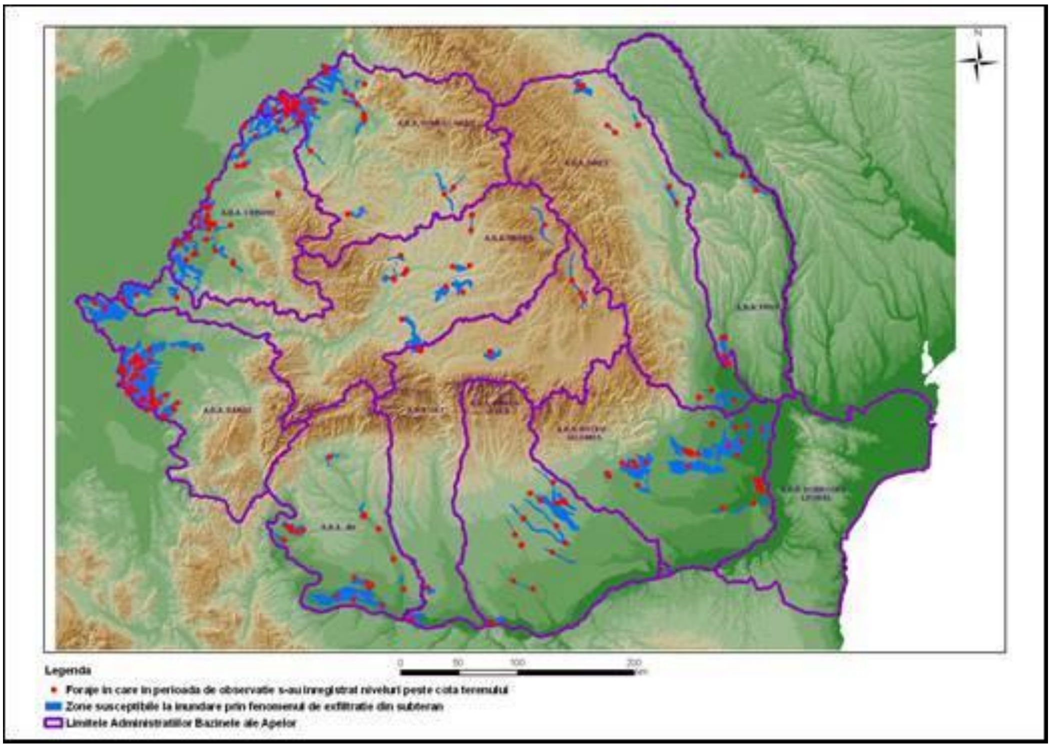


Figure 25. Extension of the spatial areas susceptible to flooding by seepage phenomenon

- Developing methodology for studying the extension of groundwater pollution from contaminants in contamined sites and use of the mathematical modeling to achieve case studies – figure 26

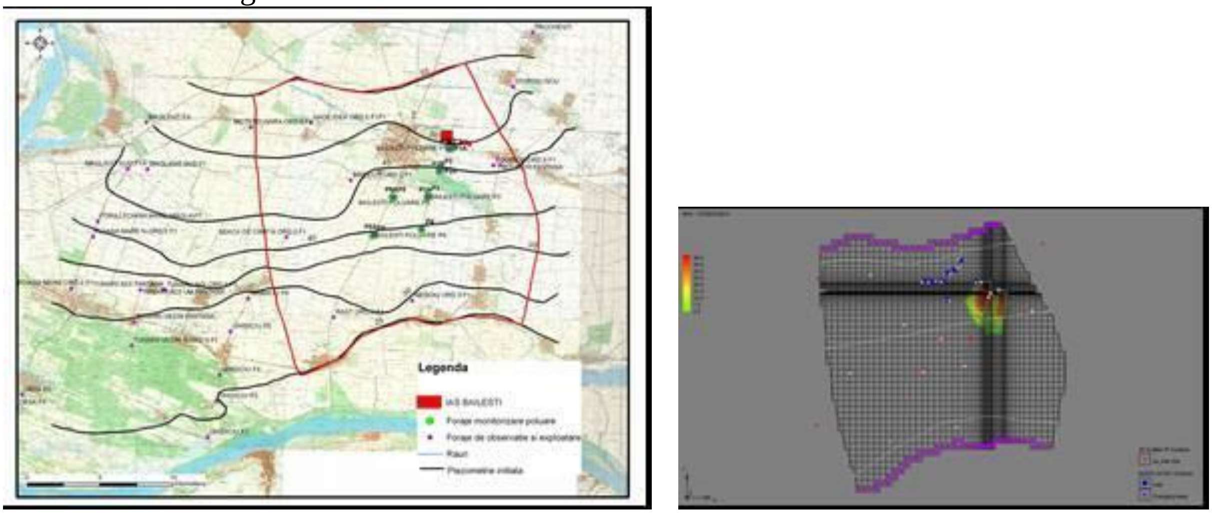


Figure 26. Example of pollutant area extension in Bailesti area obtained by mathematical modeling

- Validation of threshold values for groundwater bodies in Romania
- Updating the description of groundwater bodies nationwide
- Assessment of groundwater resources in the groundwater bodies identified and described according WFD requirements
- identifying of protection areas for groundwater abstraction , in order to protect against human impact at river basin scale and prevention of accidental pollution ;
- research of anthropogenic impact generated by renewable energy (especially utilization of heat pumps) in order to replicating their effective and according to the legislation.

2.4. Coupled Land-Atmosphere Systems

The knowledge of water balance in a hydrographic river basin is the essential condition for an advisable exploitation of water reserves. The atmosphere detains a wide quantity of vapors which comes almost exclusively from the evaporation process at the surface of the planet.

Evaporation is one of the most important elements in complete study of water balance, as well as conceptual hydrological models, lately becoming a parameter of interest in climate change studies.

Also, evaporation is a complex hydrometeorological parameter, independent of vegetation and soil characteristics of the area. Currently, in Romania this parameter is direct measurements within 55 evaporimetric stations (figure 27), of which 11 lake stations and 41 interfluve stations and 3 experimental stations.

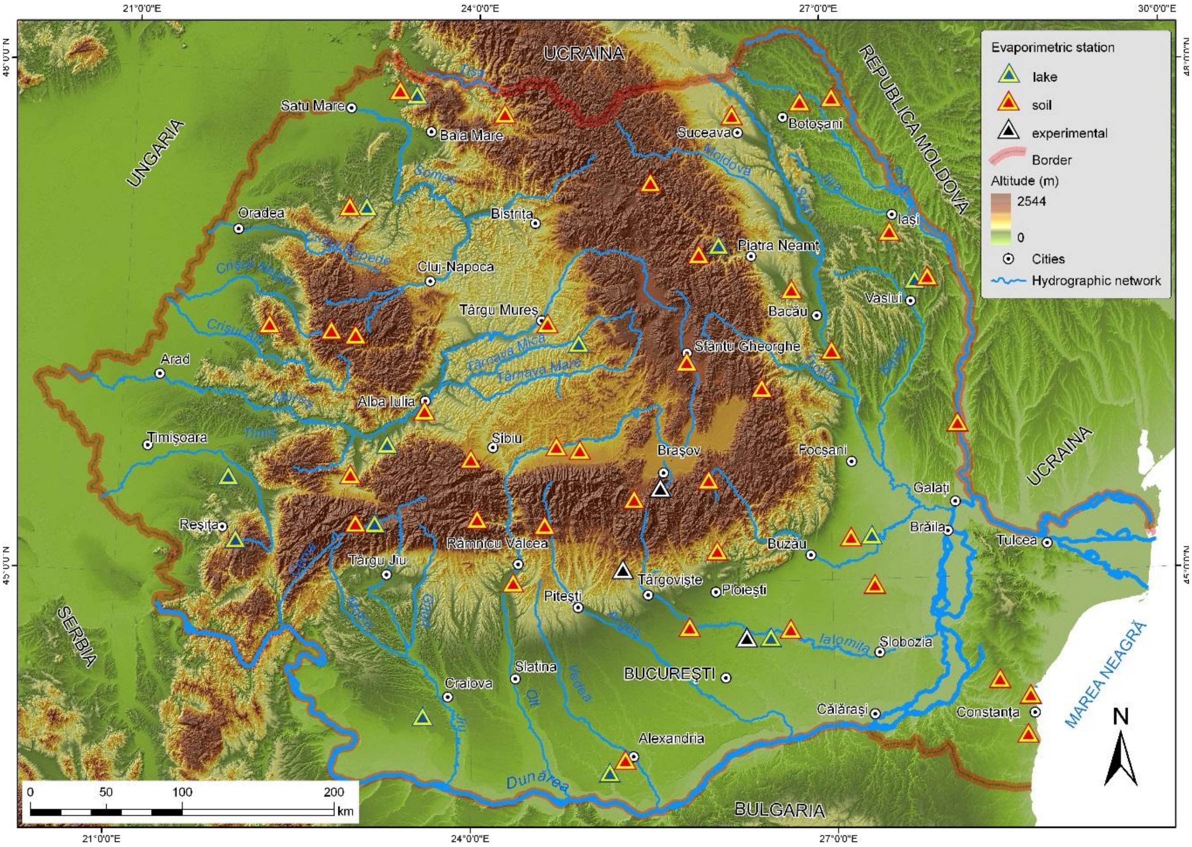


Figure 27 The distribution of evaporimetric stations in Romania

Evaporation research in Romania is based on experimental measurements performed on three stations located in different geographical areas and climatic conditions (plains – Caldarusani, hill - Voinesti and mountain - Poiana Brasov).

The main purpose of experimental evaporimetric stations is the research of evaporation from the water surface (figure.28), soil and snow, evapotranspiration (figure.29) at free soil and covered with vegetation (crops) for different geographic regions of the country.

Figure 28. Evaporimetric platform at Caldarusani station

Figure29. Lysimeter network at Voinesti station

Evaporation is the most difficult to estimate of all hydrometeorological parameters, since its measurement involves the understanding of several parameters such as: air temperature, precipitations, relative humidity of the air, solar radiation, wind speed, sunshine duration, etc.

Many researchers established methods of calculation for the synthetic calculation of this parameter, which include different ratios of essential atmospheric factors, in determining the evaporation process (solar radiation, air temperature, saturation deficit, the wind).

The most used methods, both nationally and internationally were: the thermal or radiative balance method (Penman method), methods based on air temperature (Thornthwaite, Blaney-Criddle, Priestley-Taylor methods), methods based on saturation deficit (Papadakis method) and methods based on several climatic factors (Turc method).

Based on studies conducted at both international and at the country level (Stan & Neculau, 2014; Stancalie et al., 2010) demonstrated that the method suitable for estimating reference evapotranspiration is the equation FAO respectively Penman-Monteith modified. The selection of the proper model for determining the potential evaporation was based on minimizing the error between the potential evaporation and the actual one.

To achieve a balance of water in a hydrographic river basin the evapotranspiration values are determinated using the FAO method and to achieve a water balance in a lake is used the evaporation values from water surface obtained through direct measurements or resulting from the synthesis relations (figure 30).

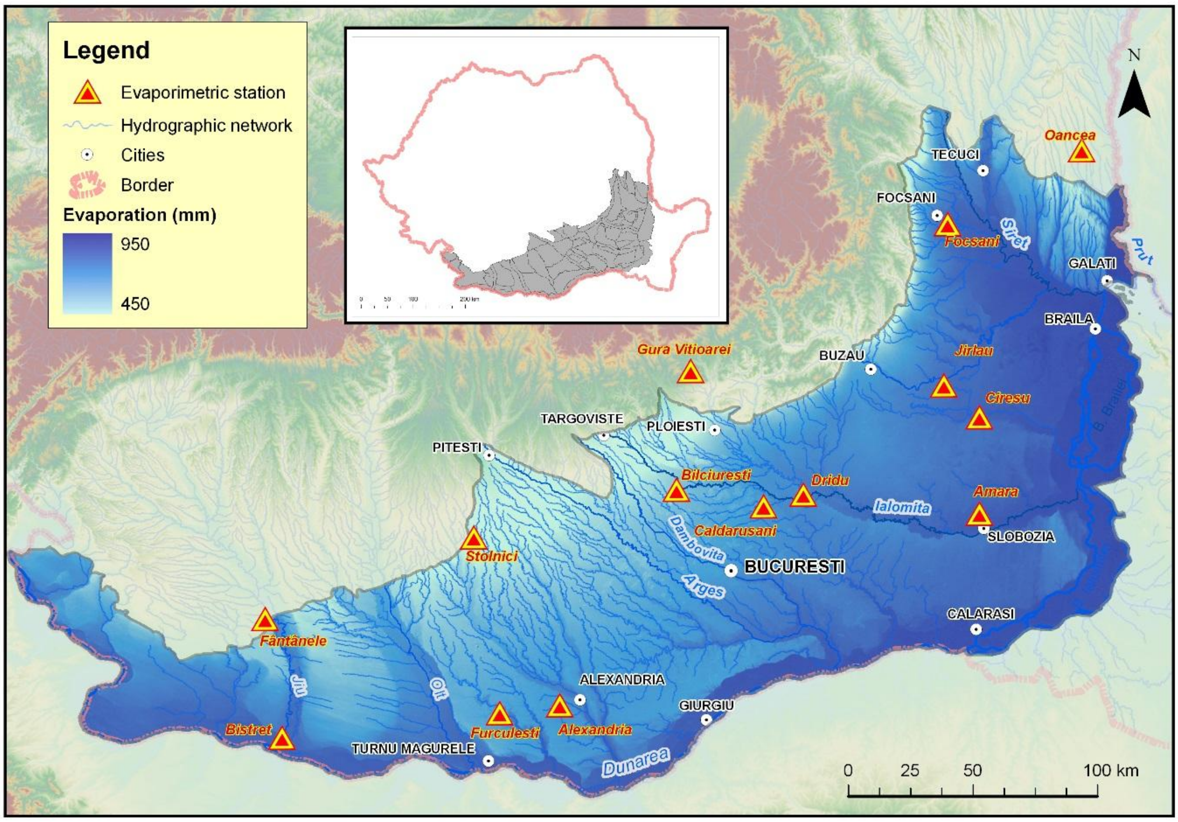


Figure 30. The map of the distribution of evaporation water surface in the Romanian Plain

2.5. Remote sensing in hydrology

In the last years the passive and active microwave remote sensing techniques have been allowed new opportunities for hydrological applications. In Romania, remote sensing techniques focused on different hydrological applications ranging from flood monitoring and mapping to water level, snow pack and soil moisture estimation.

Flood monitoring and mapping represents in Romania one of the most frequent hydrological application where remote sensing techniques proved their utility (figure 31). Numerous projects implemented in the last 15 years in our country (NATO SfP 978016, PNCDI2 SIGUR, PNCDI2 RISCASAT, FP7 SAFER) aimed to develop processing techniques which were able to combine optical and radar data and to map the flooded areas.

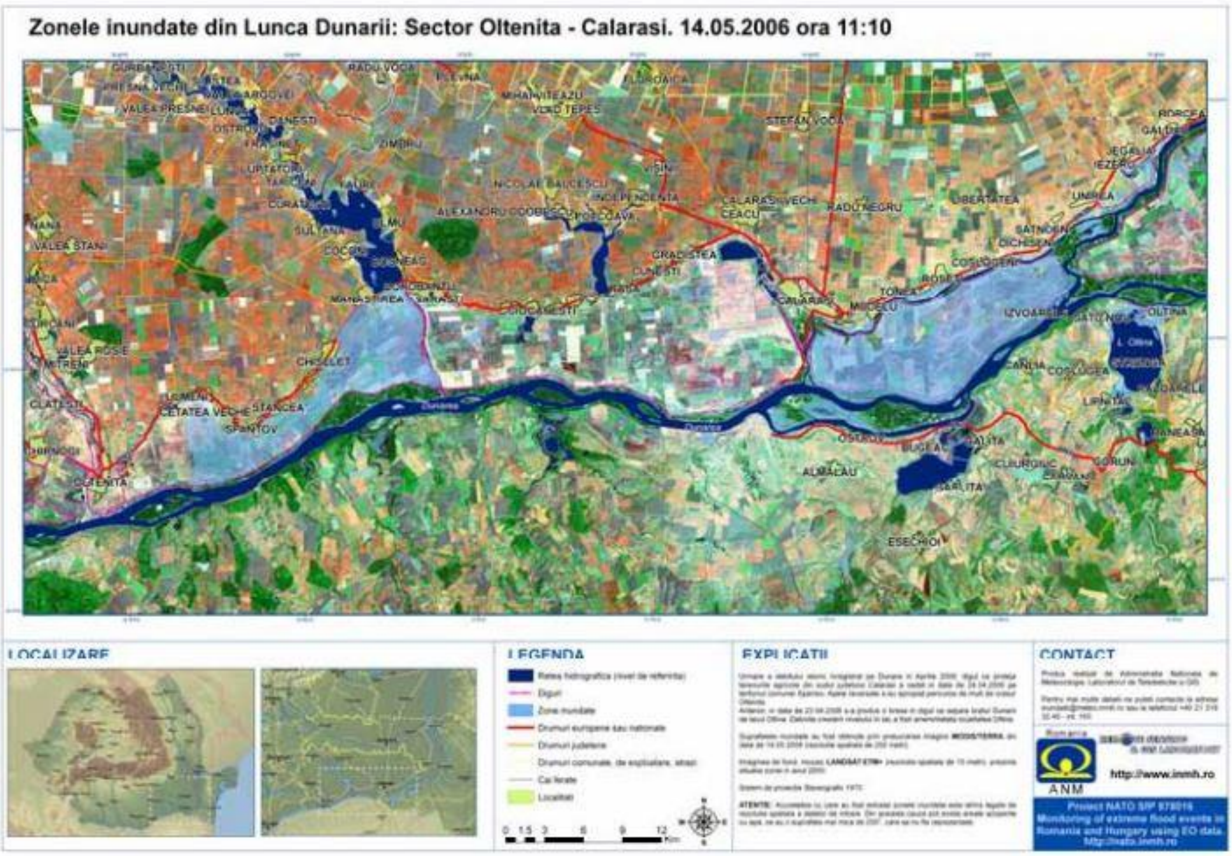


Figure 31 Flood Map of the Danube Sector between Oltenita –Calarasi (14.05.2006)

The interferometric technique as Differential Synthetic Aperture Radar Interferometry (DInSAR) was used to investigate the water dynamics in the Danube Delta. Phase observations from radar offer the new opportunities to infer information about hydrological parameters as water level changes, directions and gradients of water flow. The study conducted by Poncos et al., 2013 focused on using the DInSAR technique in order to identify the water level changes in the Danube Delta from ALOS PalSAR scenes (Figure 32). Conclusion of the study reveals that the water dynamics proved to be much more complex than expected and rapid pass missions as Sentinel and additional bathymetry measurements are required for a better interpretation.

Radar remote sensing techniques are also testing for snow pack monitoring in the framework of the project SnowBall Project (http://snowball.meteoromania.ro/about/about-snowball). Snow monitoring is essential for prediction of flooding due to rapid snow melt, to provide snow avalanche risk forecasts, and for water resource management, including hydropower production, agriculture, groundwater and drinking water. The project will deliver a prototype snow monitoring system that combines daily satellite data from Sentinel-1 and Sentinel-3 with in-situ weather station observations and state-of-the-art snowpack and climate modelling.

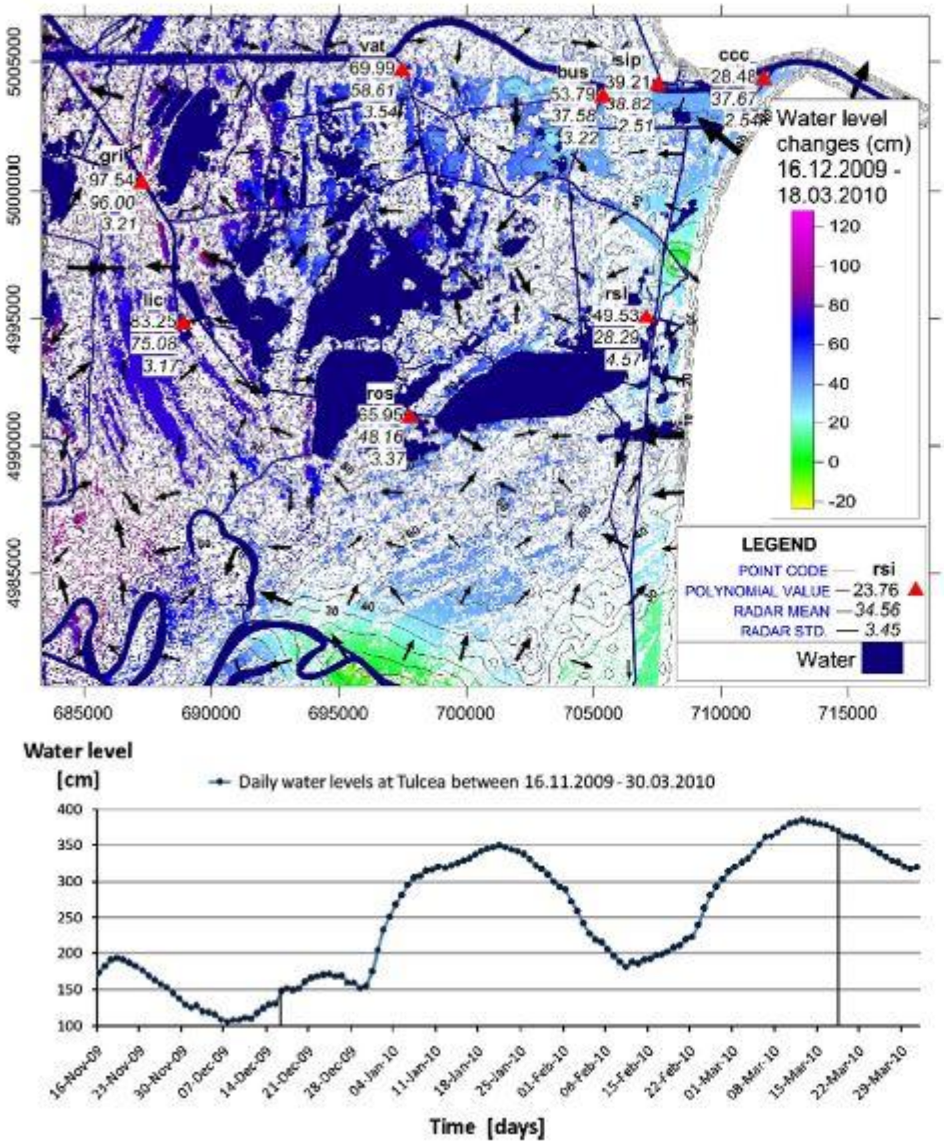


Figure 32, After Poncos et al.,2013 DInSAR water levels change map, bottom – daily measured water levels at reference point - Tulcea Harbour (16/12/2009–18/03/2010)

Another application of radar remote sensing technique is related to soil moisture estimation from EO data. ASSIMO project aims to paving the way for the utilization of satellite derived soil moisture products in Romania, creating the framework for the validation and evaluation of actual and future satellite microwave soil moisture derived products. The main project's activities are validation and evaluation of ASCAT/SMOS/Sentinel-1 soil moisture products compared with in-situ data from RSMN and the national agro-meteorological network.

Activities related with soil moisture satellite products are also carry out in the framework of PSMLAND project which aims to investigate the role of soil moisture in landslide occurrence at catchment scale in the Ialomita Subcarpathians. The soil moisture estimates from SMOS data were compared with in situ soil moisture measurements and hydrological modelled estimates. The results show a good agreement between the three techniques regarding soil moisture variation in the top of soil. The low spatial resolution of SMOS data (40km) represents a limiting factor for using this satellite product at small catchment scale, but the new products as Sentinel 1 will allow unprecedented new opportunities for hydrological applications.

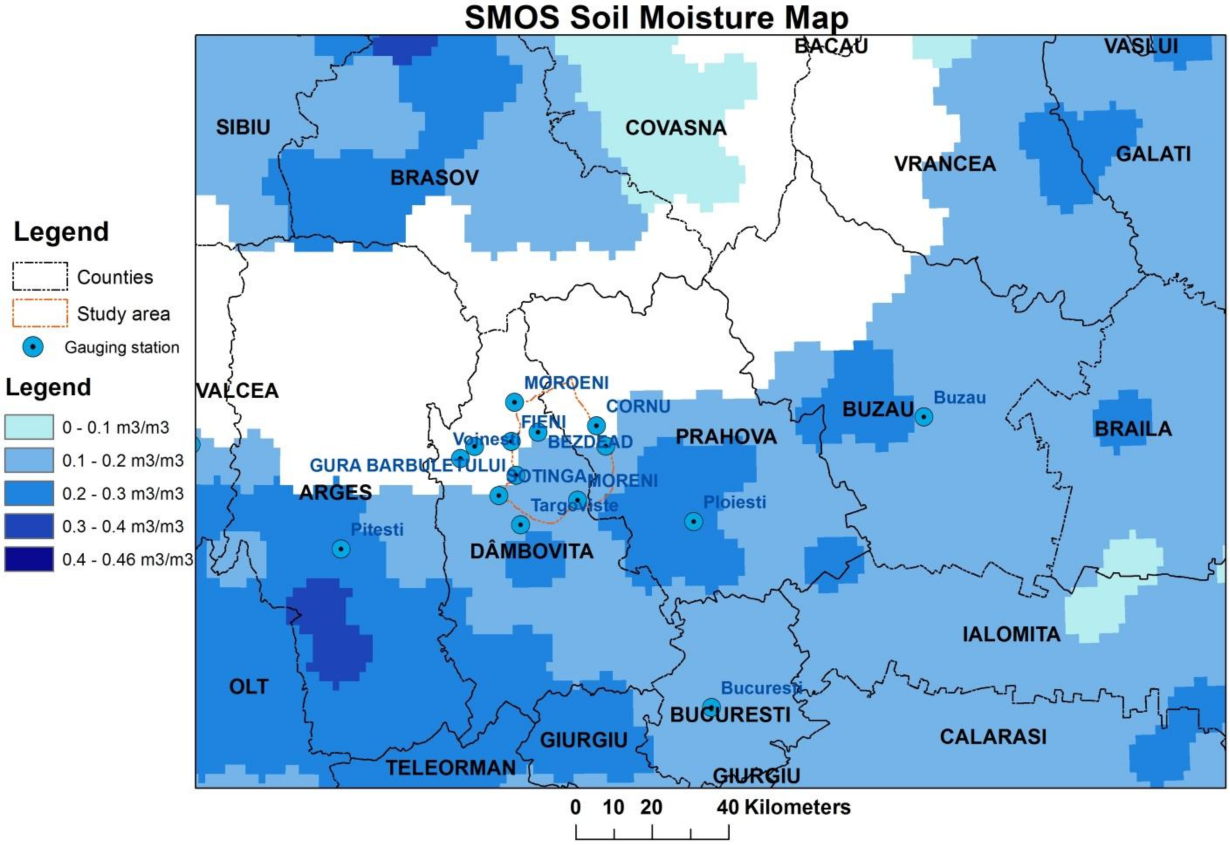


Figure 33. SMOS Soil Moisture Map for Curvature Subcarpathians, Romania

Interesting application was developed by TERRASIGNA for the Danube, which represents an area in continuous change and evolution, confronted with specific environment related issues (Valentin Poncos, Delia Teleaga, Florin Serban, 2013); monitoring of wetland areas using SAR techniques, represent a monitoring solution using new technology. Important aspects to be monitored are draining and inundability, the top soil texture and the land deformation. When optical and/or infrared satellite imagery is used, the main application is mapping of open water, vegetation types and its condition, but ground stability or flooded vegetation cannot be monitored.

Complementary to optical, a radar signal can penetrate through most of the Deltaic vegetation and retrieve the surficial structure of the ground. Therefore, the employed method was based on Synthetic Aperture Radar (SAR) imagery.

Synthetic Aperture Radar (SAR) amplitude and phase observations provide new opportunities to measure hydrological parameters such as: water surface extent, water level changes, direction and gradients of water flow. These measurements are very useful to describe the present state of a wetland, to better understand the hydrological interactions between the different types of reservoirs and to refine current hydrological models dedicated to wetland management.

Human operator access in most parts of the Delta is extremely difficult, if not impossible. Therefore satellites provide easy access and a global view of a very dynamic and complex area.

The results

ESA is supporting the Hydro-SAR project - Hydrological monitoring of wetland areas using SAR techniques - that aims to develop a Wetland Water Monitoring (WWM) prototype service based on optical and SAR data.

The Hydro-SAR project is implemented by TERRASIGNA (formerly known as Advanced Studies and Research Center – ASRC), a Romanian company with extensive expertise in satellite data processing and interpreting, and National Institute for Marine Geology and Geoecology

(GeoEcoMar), a Romanian leading research institute in the field of Geology, Geophysics and Geoecology, with focus on aquatic, marine, deltaic and fluvial environment.

The prototype service is currently being tested in the Danube Delta, Romania - the second largest delta in Europe that covers more than 1300 square kilometers, with unique characteristics in the world.

The following products are envisaged to be offered: wetland water extent maps, wetland water flow directions maps, wetland water level changes maps and, if a relevant number of SAR scenes available, a water level changes predictive model based on SAR data.

Wetland water extent maps

Water surface delineation can be done using optical and / or SAR remote sensing data. Both kind of data have their own characteristics which, depending on the targeted feature, can be seen as an advantage or drawback.

Disregarding cloud cover, an optical scene can provide very accurate (depending on its resolution) open water extent delineation of water bodies which are uncovered by vegetation.

On the other hand, radar imagery is not influenced by weather and do not 'see' thin layers of vegetation on water bodies, but the radar 'sees' as water also very high moisture/water saturated ground, marshy soil or sand dunes – figures 34 and 35.

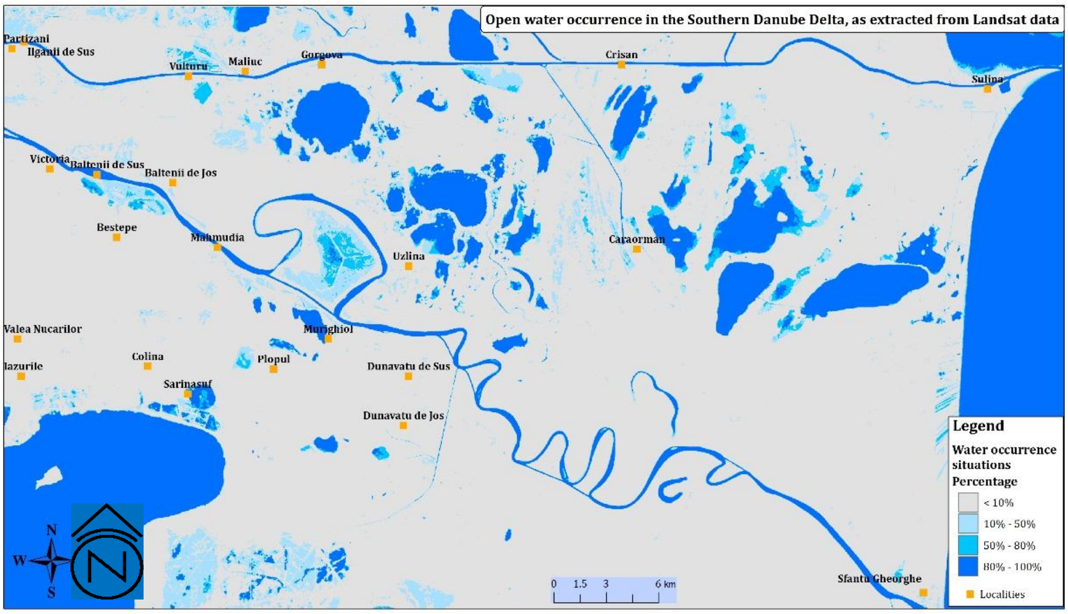


Figure 34 Open water occurrence in the Southern Danube Delta

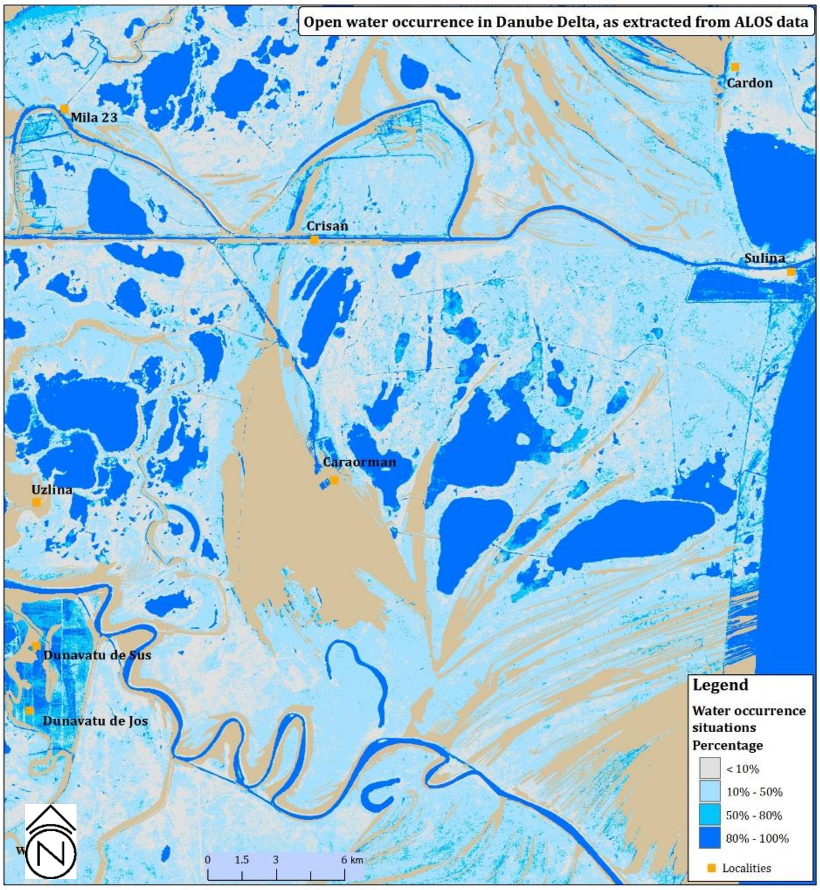


Figure 35 Statistical representation of the areas covered by water, extracted from 14 PalSAR data acquired during 2007 – 2010

Wetland water flow changes and directions maps

It was shown in (Alsdorf et al., 2001; Wdowinski et al., 2008;; Poncos et al., 2013; Poncos et al, 2014) that SAR interferometric phase can be related to water level changes in aquatic environments with emergent vegetation.

As water level and water level changes tend to be different across barriers, these differences will be shown in the interferogram as phase discontinuities. Consequently, useful and important observations of flow patterns and flow discontinuities can be derived directly from the raw interferograms, without the need of stage data for calibration.

Figure 36 illustrates a very interesting delimitation of water bodies with individual flow regimes when the absolute water levels are generally low, and the Delta is in a stationary regime. In this case, a number of water bodies start to have a local, individual behavior (as opposed to the case of high water levels when the bottom is deep under water). At this water level, the shapes of the individual water bodies can be clearly distinguished and the flow channels can be detected.

The study of the phase change in the wrapped interferograms shows many small regions with different patterns. Some of them are clearly explained by the lakes and the natural or anthropic channels present in the delta, but some are not. In Figure 7 is shown an area North of Lake Lumina (Garla Vatafu-Imputita), covered mainly by floating reed, in which a few small areas with distinct fringe patterns, thus with different flow behavior, may be identified (Figure 37).

This information is intended to be used to better understand the direction of the water flow within wetland, not on the channels, and thus as further input to water dynamics modelling in Danube delta.

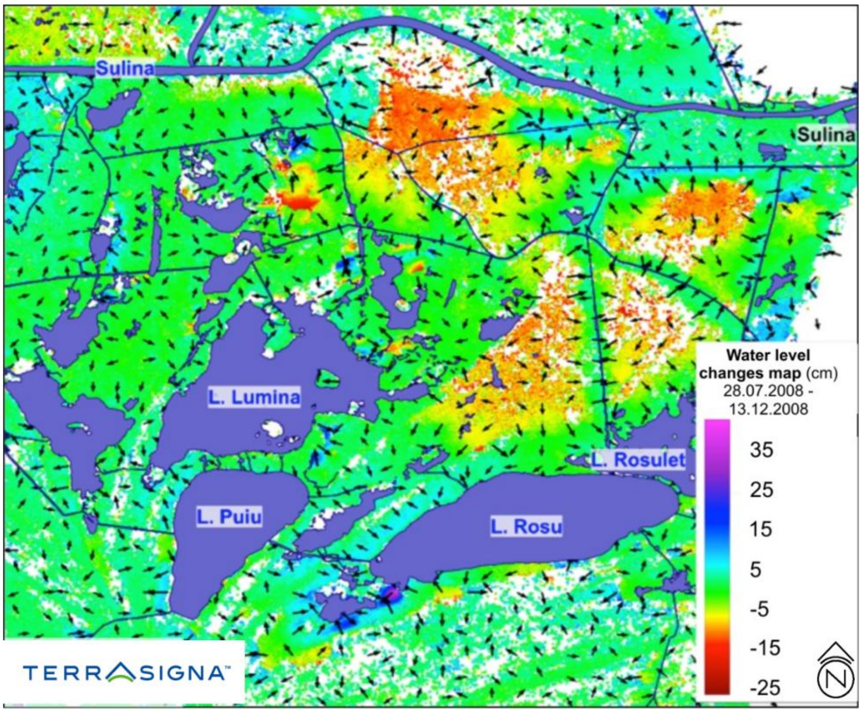


Figure 36 Water level changes map over central part of the Danube Delta, Romania, formed by open water bodies, standing reed swamps and floating reed plaur areas. SAR data reveal flow paths (the arrows drawn in the direction of water level increase), wetland dynamics and local-scale water divides.

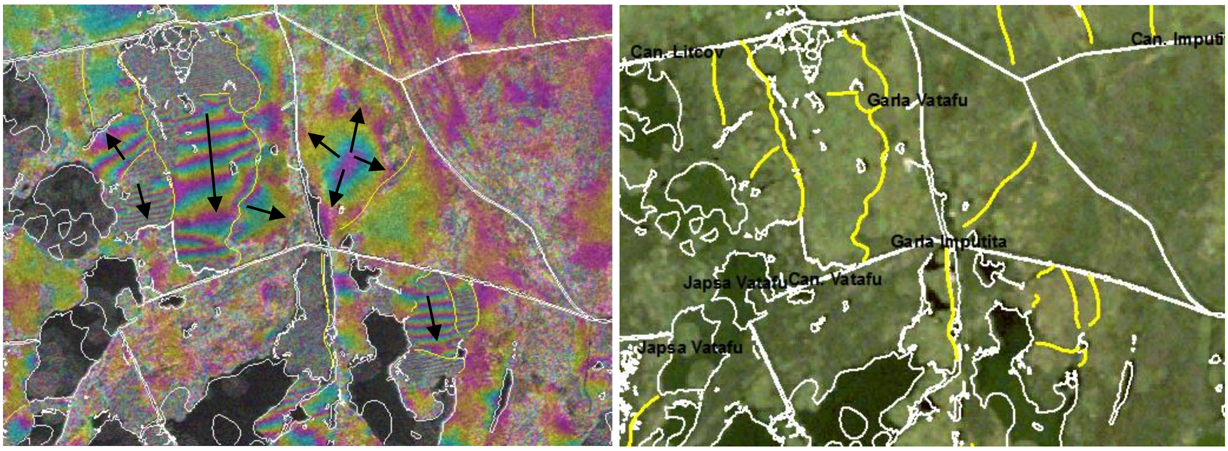


Figure 37 (Left) Alos PAlSAR interferogram (18.06.2010 – 03.08.2010) over an area covered mainly by floating reed; (Right) Landsat scene over the same area. White lines – contours of water bodies and channels; Yellow lines - semi- or impermeable water divides, deduced from abrupt phase changes in the interferogram. SAR data reveal flow paths (the black arrows drawn in the direction of water level increase), wetland dynamics and local-scale water divides.

2.6. Tracers

"Danube WATER integrated management is a strategic project to implementation of Danube Strategy and Programme Romania-Bulgaria cross-border development. In this project it was realised an isotopic study called "Research and detailed analysis of groundwater located along the border RO / BG using environmental isotopes", as part of the project „Danube WATER integrated management.

This study / research was made in order to provided the current state of environmental isotope contents (Tritium, Deuterium and Oxygen-18) and it can be used as a reference for assessing developments natural changes caused by environmental factors and impacts of anthropogenic effects.

It were performed: isotopic analysis of spatial distribution, isotopic analysis of statistical terms, co-relational, zonal and water types analysis, temporal evolution, on isotopes and water types, mean residence time (MRT) groundwater calculation and hydrogeological context classification results.

As an integral part of modern hydrology the isotope methods contributes to the possibility of getting a detailed insight into the water cycle and are also a means of optimising the treatment of groundwater reservoirs or wells. Measurements of the environmental isotopes enable observations of hydrological systems in extensive geographical scales and time scales. The identification of isotope contents is used to answer questions on topics like: the condition and time of movement of groundwater; the origin of individual elements; hydrogeochemical processes such as water-rocks interaction; specific transport processes; groundwater mixing systems.

The most important environmental isotopes used are: Tritium (^{3}H), Deutérium (^{2}H,D), Oxygen -18 (^{18}O).

Study area for the isotopic study is located along the Danube, from Calafat / Vidin to Calarasi / Silistra, covering a wide strip of about 30 km, divided equally in Romania and Bulgaria (Figure 1). Counties of Romania bordering the Danube in this study area are: Mehedinti, Dolj, Olt, Teleorman, Giurgiu and Calarasi and in Bulgaria are: Vidin, Montana, Vratsa, Pleven, Veliko Tarnovo, Ruse, Razgrad and Silistra.

The objective of this isotopic study was a detailed investigation of all of type of waters in this area (Figure 38): surface waters (inland rivers, Danube and his tributaries on both sides) and groundwater (groundwater, medium depth and deep, also on both sides of the Danube), in order to determine current relations between surface water and groundwater.

Figure 38 – Study area and investigation water points

During 6 months, in Romania and Bulgaria, was sampled 33 points of water, 100 samples, 400 isotope analysis for: ^{3}H, ^{2}H (D), ^{18}O

Interpretation of experimental data was made into 5 directions: as spatial distribution, as statistical average, correlational analysis $\delta D - \delta^{18}O$, temporal evolution and mean residence time.

Interpretation of experimental data as spatial distribution (Figure 39)

- ✓ Bidimensional interpolation to entire area scale it's practically impossible
- ✓ Tritium has generally decreases with the depth of the groundwater, but these decreases are randomly.

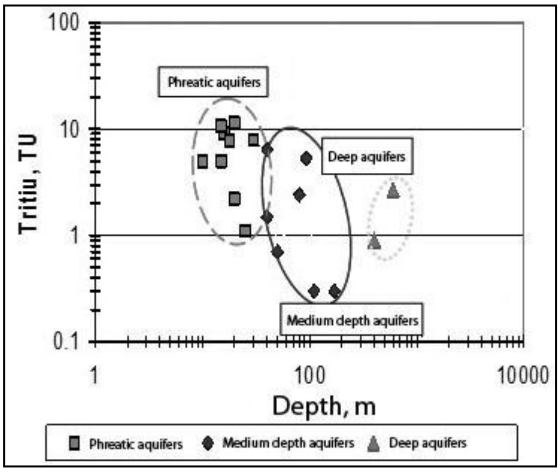


Figure 39 - Distribution of tritium activities (in July 2013) on types and depths of groundwater

Interpretation of experimental data as statistical average

There are clear differences between the types of water:

- ✓ averages of δO and δD are more negative in Danube than in interior rivers;
- ✓ small ecart in variation of δO, δD & d for Danube;
- ✓ most negative values of stable isotopes occur in the medium depth waters ;
- ✓ maximum values of tritium are lower in interior rivers than Danube.

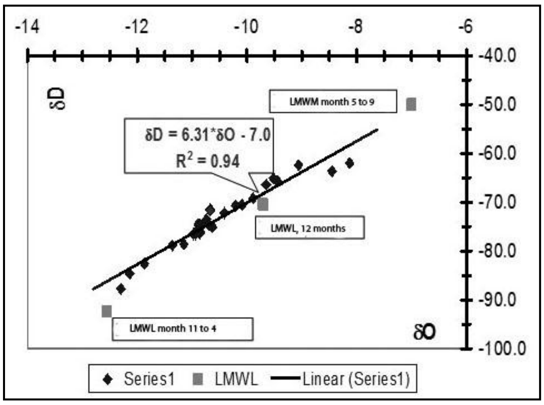
Interpretation of experimental data as correlational analysis δD – δ^{18}O

δD – δO –global analysis (Figure 40)

- ✓ δD = 6.31*δO-7.0 equation is close to LMWL;
- ✓ points are grouped around LMWL tested for 12 months, slightly shifted towards the cold season;
- ✓ three couples of values are slightly deviated from the regression line.

δD – δO on water types (Figure 41)

- ✓ the most closest equations to LMWL are Danube and medium depth waters,
- ✓ the most deviate equations from LMWL are interior rivers,
- ✓ phreatic waters regression line is between interior rivers and medium depth water lines



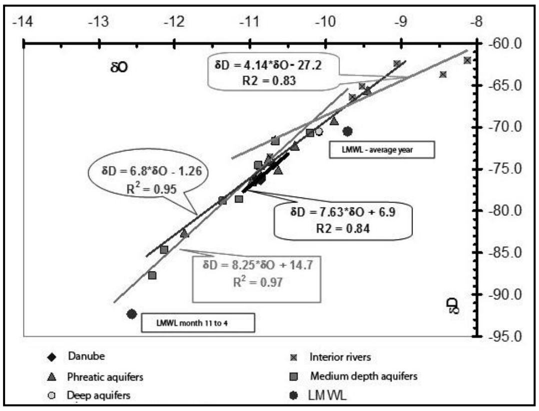


Figure 40. Global diagram δD - δO

Figure 41.Diagram δD–δO on all water types

<u>*δD – δO on three types*</u> (Figure 42)

- ✓ all waters tested are between the LMWL values;
- ✓ most grouped and centered values are for phreatic groundwater, except Modelu area
- ✓ most negative values are for the medium depth waters at Modelu and Mizia FTK1
- ✓ the less negative values of interior rivers are for Skat and Vedea rivers = an intense evaporation
- ✓ the most negative torque isotopic values for interior rivers was found for Bara River = high input of groundwater?

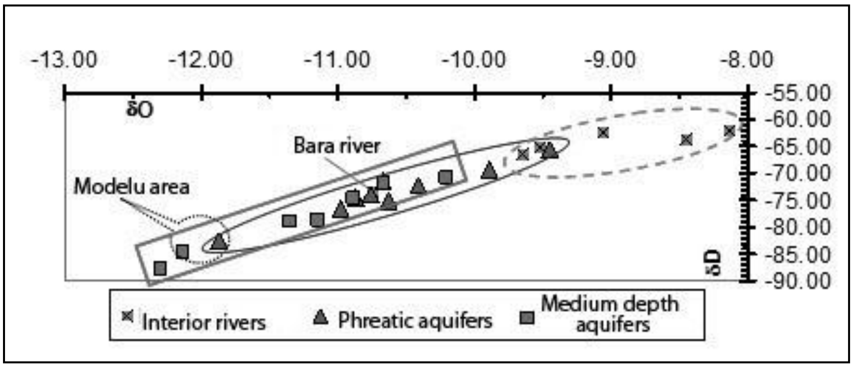


Figure 42- Diagram δD–δO on three water types: interior rivers, phreatic and medium depth aquifers

Interpretation of experimental data as temporal evolution

<u>*Stable isotopes*</u>

Danube - there is a seasonal variation; *Interior rivers* - there is a poor seasonal variation - content are lowered by 7-12 δ units to the Danube; *Groundwater* - practically constant isotopic content

<u>*Tritium*</u>

Danube

- significant variations: in Cetate - Bechet sector, values are grouped uniform: 9 - 15 TU; in Zimnicea - Calarasi sector values grow from 10 to 20 TU in 4 months of 6 measured;
- linear correlation averages is good;
- sliding average of 2 period approximates the evolution of the average values.

Interior rivers

- constant content;
- Skat and Bara rivers - constant content, but low values = input of medium depth waters?

Groundwater - constant TU values on entire monitoring

Interpretation of experimental data as mean residence time

The “input function” for Tritium in groundwater is: *h3rom.inp* and the “output function”: determined experimentally for TU in groundwater.

After the interpretation of experimental data we can make the following general remarks on isotopic results in hydrogeological context:

- ❖ In terms of <u>spatial zoning</u> the groundwater present toward depth:

- negativity of stable isotopes;
- increasing of "minimum age"

❖ In terms of the <u>evolution of regional</u>

- phreatic groundwater - negativity continuous from W to E for δD and "d";

❖ In terms of the <u>seasonal variation</u> (for study period)

- constancy monthly average tritium activities in all groundwater;
- decreasing values for "d" are well defined and continuous for phreatic groundwater;
- continuous decrease of values "d" for medium depth waters

❖ In terms of <u>regional characteristics</u>

- tritium values are very low (<0.3) - in the W area of study: Rast and Lom;
- Chirnogi area - medium depth groundwater isotopically undifferentiated = very slow input
- deep groundwater from Giurgiu - input from the Danube.

The study provided a database of 400 values, the current state of environmental isotope contents and it can be used as a reference for assessing developments natural changes caused by environmental factors and impacts of anthropogenic effects.

The information presented can be used in order to improve mathematical models of groundwater flow in different areas.

2.7. Statistical Hydrology

In the statistical analysis of the maximum discharges one of the main concerns of the Romanian hydrologists was to estimate the interval containing robust estimates of extreme quantiles.
Different statistical distributions can be chosen for fitting the empirical distributions (B. Bobée et all, 1993, D. Koutsoyiannis, 2005 etc). To create a probabilistic model of the maximum discharge values the following distributions of extremes are recommended: Generalized Extreme Value Distribution, Pearson Type 6 Distribution, Weibull Distribution, Log-Pearson 3 Distribution, Log-Gamma Distribution, Gumbel Max (Maximum Extreme Value Type 1) Distribution, Log-Logistic Distribution, Generalized Gamma Distribution etc (Maidment, 1992).

In practice, all these models are fitted to data and compared using conventional goodness-of-fit tests. However, all tests of the statistical model adequacy are based on the central range of the sample, while the adequacy should be tested for the extreme range of observations in order to estimate high return period events (El Adlouni et al, 2008).

Since extreme values are rarely available and raise problems related to their empirical probability of exceedance a recent approach in Romania introduced by Drobot and Draghia is to use a large number of theoretical distributions (30 or even more) and to order them according to their adequacy based on statistical tests (Kolmogorov-Smirnov, Anderson-Darling or Chi-Squared test). For each probability of exceedance a histogram showing the distribution of the computed values is obtained. The "true" value of the discharge for each probability of exceedance is considered to correspond to the maximum frequency of the theoretical values computed by different statistical distribution.

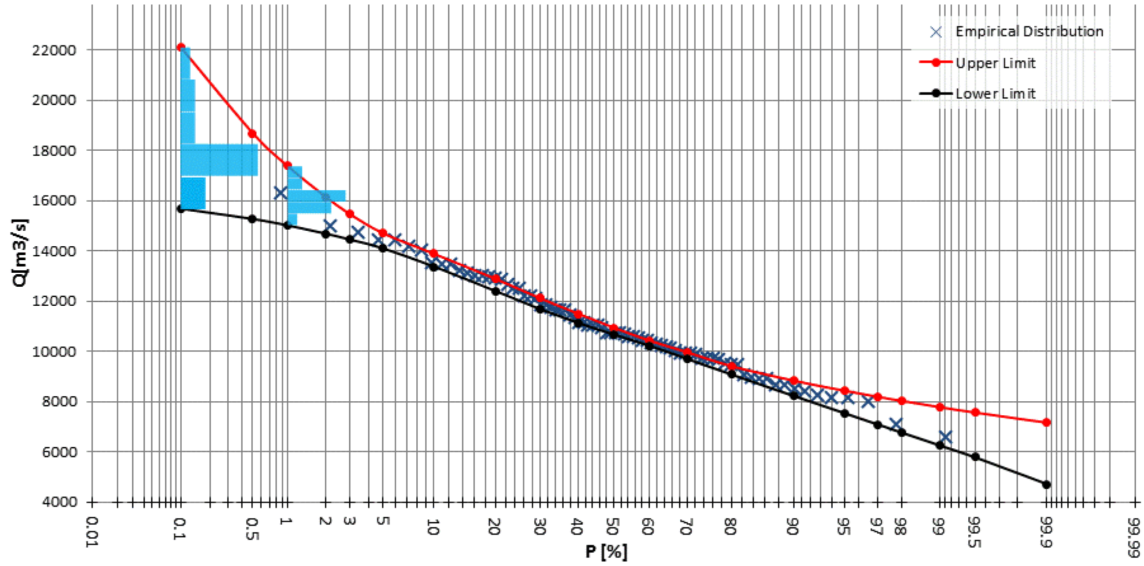


Figure 43 Evaluation of the extreme discharges at Turnu-Magurele gauge station (Drobot and Draghia)

For instance, according to Figure 43 the maximum discharge corresponding to 0.1% probability of exceedance at Turnu-Magurele gauge station on the Danube River can be considered 17,500 m^3/s, despite the large range of the computed theoretical values (between 15,600 and 22,000 m^3/s).

Another approach is to use one single statistical distribution and an increasing number of generated values of the annual maximum discharges. Based on the sample data of maximum annual discharges at the same gauge station, a set of 1000 values following the log Pearson 3 distribution and keeping the same statistical parameters were randomly generated.
In the following, the quantiles corresponding to different probabilities of exceedance were computed for the generated values, by increasing step by step the number of processed discharges from 80 to 1000. The evolution of the maximum discharges corresponding to 0.1% probability of exceedance with the increase of the number of processed values is presented in Figure 44. One can notice the strong variability of the maximum discharges corresponding to the first 200 registered plus generated values, and the stabilization of these discharges for larger numbers of sample volume. The stabilized values are in the range (18,500; 19,000) m^3/s.

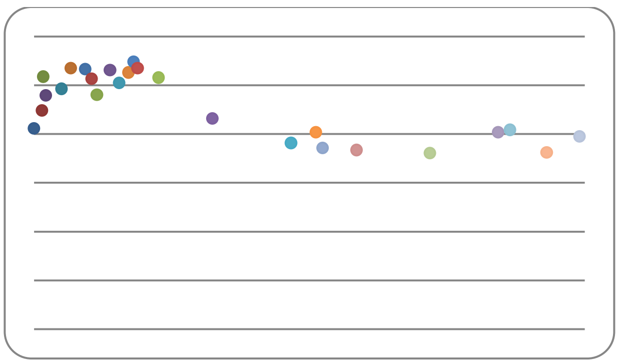


Figure 44. Evolution of the extreme discharges at Turnu-Magurele gauge station with the increase of number of processed discharges (Drobot and Draghia)

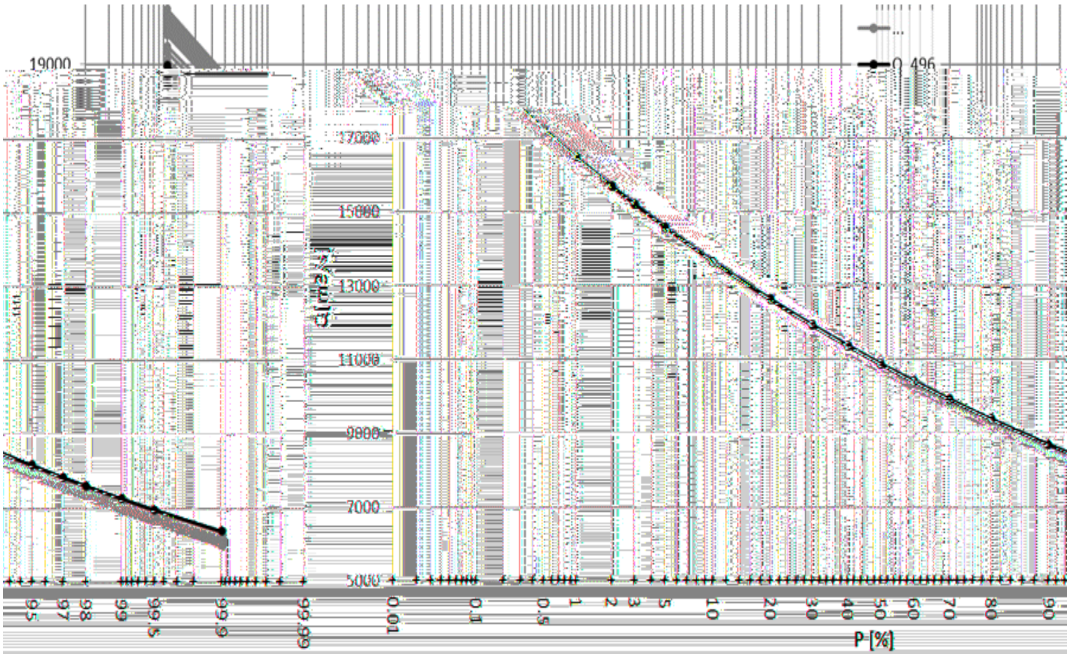


Figure 45. Cumulative distribution curves at Turnu-Magurele gauge station for different number of processed discharges (Drobot and Draghia)

From Figure 45 it can be seen that the maximum discharges $Q_{p\%}$ present fluctuations depending on generated values, which reflects wet or dry periods. These fluctuations of the maximum discharges can reach 10% for 0.1% probability of exceedance and 8% for 1% probability of exceedance respectively. For practical purposes it is recommended to consider an interval of the maximum discharges or at least the mean value of the discharge variability interval.

2.8. Erosion and sediment transport

In the Romanian Carpathians, developed on crystalline and volcanic rocks, the main geomorphological processes are rockfalls, debris fl ows, and topples. In the eastern part of the Eastern Carpathians, built up of Cretaceous and Paleogene flysch, landslides and mud flows are of major signifi cance. High and middle mountain karst features and cave systems are also widespread. In the alpine area of the Southern and Eastern Carpathians, avalanches are common on the steep slopes ofglacial cirques and valleys. Landslides also develop on high quarry slopes, waste dumps and tailing dams characteristic of the mining sites of the Apuseni Mountains. High discharges along the Carpathian rivers cause intense erosion and the undercutting of slopes, favoring landslides and fl ooding. Although in fl uvial erosion channel incision is predominant (for half of all river sections studied), riverbed aggradation is also observed locally. On the agricultural lands of the Subcarpathians and in the Transylvanian Depression slopes are degraded by sheet and gully erosion, landslides, and mudfl ows. On the Moldavian Plateau soil erosion, gullying, and landslides are major exogenous geomorphic processes. The country-wide spatial distribution of these geomorphological hazards has been evaluated by several authors (Dan Bălteanu, et all, 2012).

In Romania, not only in the mountain and slopes, but one third of territory is affected by soil erosion process, doubled by a dry trend in climate, therefore, there are necessary ample measures of antierosional works. Among these, antierosional forest belts and plantations establishment represent a major approach. Researchers in USAMV tried to identifie the best practices and establishment modalities of antierosional works, as well as main areas where they should be established; reforestation remained one of the most important “win-win” practice. In recent observations, USAMV team analyzed the behavior of the tree species, forest belts spatial design and its antierosional efficiency in different zones from the country. Antierosional forest belts are to be established on contour lines of the affected or predisposed to erosin versants. Space between belts is determined based on the criticial erosion distance, as varying between 100- 150 m to 300 m, depending on the erosion degree, lands topography and land use. Belts width is set upon both rainfall and land features, as varying between 10 - 20 m up to 60 m on strongly eroded slopes. Regarding the species assortment, the most efficient, both in terms of halting erosion and stand evolution, shows the mixes of principal, secondary and shrubs woody species, in a designed spatial structure with tallest tree species centrally positioned, while other species are placed toward the edges of belts in descending height order to bushes on both sides. Most promising tree species for further use in the composition of the antierosional forest belts are: oaks, sycamore, maple, ash, common walnut, cherry, locust, honey locust, flowering ash, Siberian elm, field maple, Tartarian maple, osage-orange, oleaster, cherry-plum, as well as shrubs: hazelnut, male dogwood, blakthorn, dog rose, under different shares depending on stational conditions. The antierosional forest belts previously established, through their both exceptional functional value and rich biodiversity, represents ecologic, social and economic environmental assets, offering the basics the future action of designing and execution works. Based on obtained results there were prepared appropriate recommendations; toward continuing of establishment of antierosional forest belts under different conditions (Costandache and Nistor, 2014).

2.9. Snow and Ice Hydrology

In Representative and Experimental basins a special emphasis is the knowledge of snow characteristics: thickness, density and water equivalent of snow. These characteristics are determined in the representative basins by systematic measurements perfomed at the profiles and on snow plots every 10 days, respectively 5 days during the snow storage and every 5 days, respectively 2 days during snow melt. In order to know the conditions under which the snow cover varies –storing, melting the situation of the snow courses and snow plots is presented from the point of view of the slope exposure and afforestation.

The water amount released by snow melting are determined from the relationships with main factors determining it: air temperature (daily mean or maximum values) and the insolation duration for various conditions regarding slope expose and afforestation. The determination of the snow cover characteristics depth, density, water equivalent over the entire basin surface are obtained by means of the relationships between these characteristics and the altitude of the snow courses and plots

Figure 46. Representative Basin Fantana Galbena and Iedut snow course

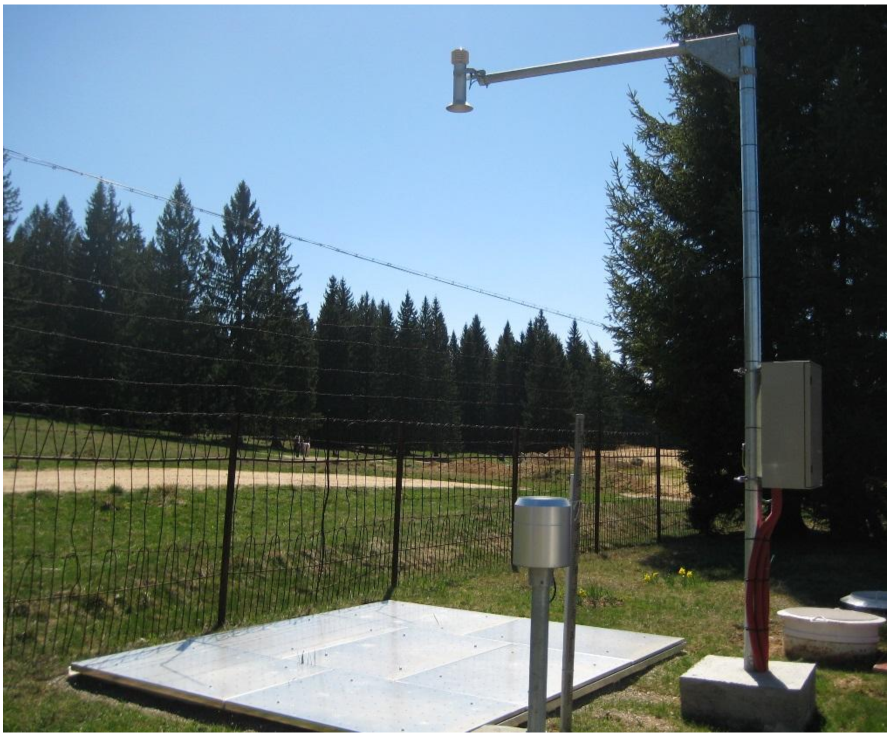


Figure 47. Automatic snow station at Poiana Brasov

2.10. Ecohydrology

The National Institute of Hydrology and Water Management perform studies in eco-hydrology domain. The main research topics are river restoration and environmental flows. These topics are challenges for European scientific community and key-issues for implementing Water Framework Directive (WFD). The river restoration and environmental flows implementation are measures that should be taken aiming at achieving good ecological status (the main objective of WFD).

Some solutions (e.g. fish aids, river banks restoration) proposed to improve river continuity (longitudinal and lateral connectivity) are the outcomes of the research activities.

Another study aiming at assessing the environmental flows is currently under development relying on the recommendations of CIS Guidance Document no 31 - *Ecological flows in the implementation of the Water Framework Directive.*

The environmental flow (EF) is defined as flow providing habitat necessary to maintain long-term development of the aquatic ecosystem (namely reproduction, feed and growth functions) and should assure optimum quantity of water and flow dynamics (frequency, distribution and variability in time) aiming at achieving the objectives of Water Framework Directive.

The method should cover the diverse features of the water bodies throughout Romania. Some preliminary results for one river typology (RO01 - rivers located in mountain, pied-mont or high plateau area) are shown in the figure 48.

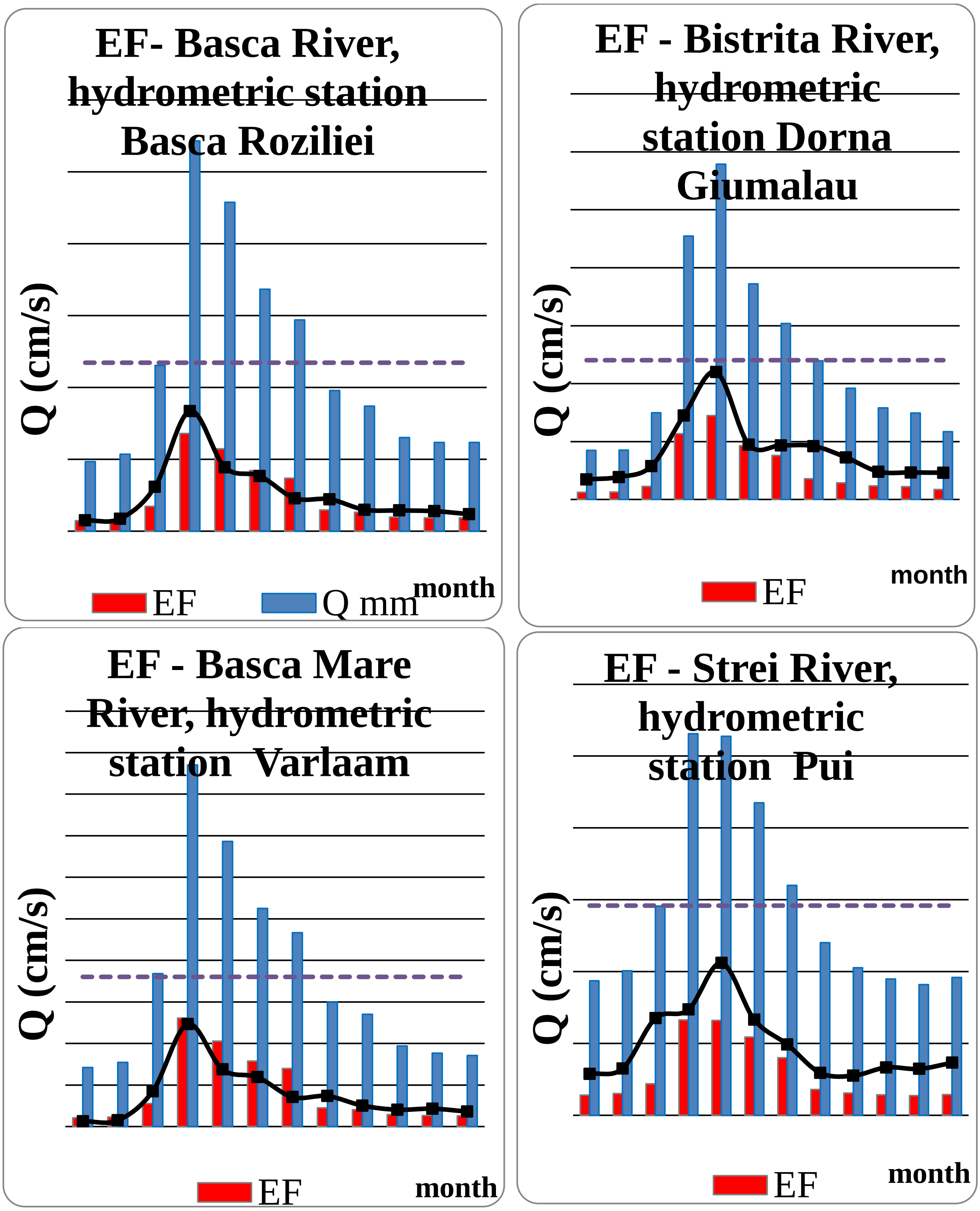


Figure 48.Environmental Flow (EF) for RO01 river typology
Qmm - monthly mean flow; Qmam - multiannual mean flow; Qmamm - minimum annual mean monthly flow

The method is a dynamic one because it calculates not only a single value for flow, but multiple values which assuring the variability of the flow which is similar to natural pattern of the flow. It follows closely the pattern of the natural hydrological regime, therefore, the natural characteristics of the river flow being kept.
Another related topic with the requirements of WFD, adopting a multi-disciplinary approach (biologist, chemist and engineer working together) is the hydromorphological assessment of rivers recognizing that the deviation from the natural status of river hydro-morphology can lead to failure in achieving the good ecological status (Figure 49).

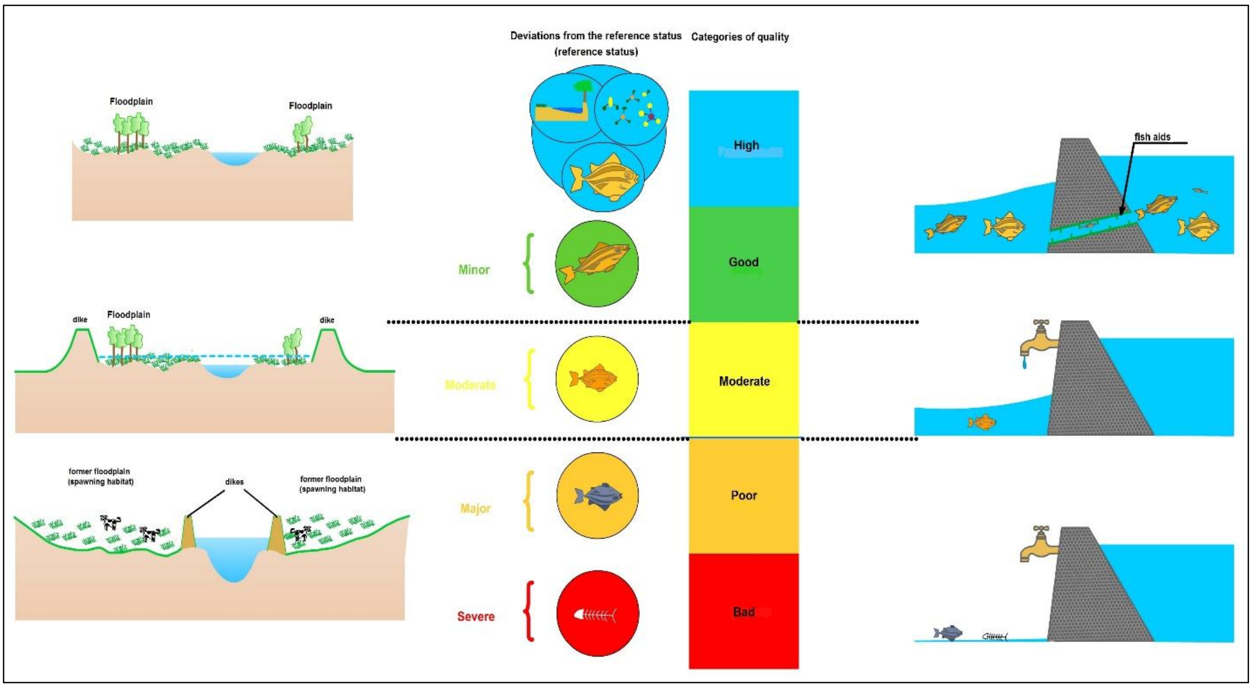


Figure 49. Ecological status classes (adapted from Peter Pollard, Scottish Environment Protection Agency)

The *Methodology for hydro-morphological assessment of Romanian rivers* is an innovative approach regarding the hydro-morphological assessment and its integration in the assessment of ecological status of water bodies (rivers). The evaluation procedure consists of a set of 11 hydro-morphological indicators, which were defined to assess: 1) the hydrological regime including flow regime and connection to groundwater bodies; 2) river continuity, including longitudinal and lateral connectivity (connection to floodplain); and 3) morphological conditions as river depth and width variation, structure and substrate of the river bed, riparian zone. The methodology was designed as tool aiming at assisting the integrated approach of the river ecological status and a sustainable water management.

Chapter 3. Participation on national and international scientific projects

Some national research projects were selected to be presented in this report:

CLIMHYDEX - Schimbări în extremele climatice și impactul asociat în evenimentele hidrologice din România– Climate exptremes changes and their impact on hydrologic basins events in Romnaia CLIMHYDEX is a national research project dedicated to climate change impact evaluation for two pilot basins in Romania. Project description can be found on the project site

- http://climhydex.meteoromania.ro

• **e-LAC** - Pro-active operation of cascade reservoirs in extreme conditions (floods and droughts) using Comprehensive Decision Support Systems (CDSS). Case study: Jijia catchement
e-LAC – is a national research project improving solutions for sustainable water management through a reservoirs cascade. The aims of the first phase of the project are related with the obtaining more information (scientifical and technical) regarding the flood and drought prevention and the modern technology used in this porpose. Also the technical investigation of the catchment has to be done for obtaining the technical data necessary for starting the development of the SCADA, ACT and CDSS.

http://granturi.ubbcluj.ro/elac/consortium/details/3

• VULMIN - The vulnerability of the environment and settlements to floods in Romania in the context of Global Environmental Change

- www.igar-vulmin.ro

• Decision-making conceptual system to support the management of urban waters (URBWATER).

• Convergent interdisciplinary solutions for territorial planning and for the structure of transport systems to attain sustainable development and a better quality of life (TERITRANS).

• Tools, guidelines and indicators to include environmental aspects in agricultural, forestry and water management policies, from top-down approaches to involving the local communities (TOGI).

• Complex ecological method of estimating and biomonitoring the Somes Drainage Basin (MONISON).

• Integrated assessment of the mining impact on the environment of the Upper Crisul Alb and Certej basins (Apuseni Mts), Romania, and cross-border river pollution.

• G I S – based elaboration of hazard maps and assessment of the quality of the environment in the mining areas of Maramures and Satu Mare counties.

• Depleting the environmental impact of hazardous solid wastes by inactivation, conformable with the EU Aquis (INERTECH)

• Sustainable management of solid wastes deposited within inactive mining sites, conformable with the EU Aquis (DESOLSITMIN).

• Transformation of old historical salines for the sustainable use of rock salt resources in eco-tourism and relaxation treatments (RESTSALDUR).

• Implementation of the European environment policy to efficiently use rock salt resources (MEDEUROSAR).

Prototype Cyberinfrastructure-based System for Decision-Making in Water Resources Management" (CyberWater) (2011-2013)

ECOMAGIS, PN2, 2012-2015,
The purpose is to: create an operational informational system that can supply meto-hydro-bio-geomorphological data collected near the coastal zone, support at a regional scale decisions.
-Supplement of data and base information to support the management/monitoring effort of the coastal marine system.
-Supplement of information, evaluation, forecast and warning on the ecological state in pilot areas of the coastal zone based on the coastal monitoring form a far/automatic, for the development of a coastal management based on the needs of the ecosystem
-Distribute the information and the forecast data to the relevant organisms and interest factors of the coastal zone.The creation of a web portal, as a synergetic combination innovation solution of the data and the information provided by the different sensors, as well as for the data change and information between regional and local interest factors.

International projects

Hydrological research teams of the national institutes (INHGA, IGAR, INCDD, INCRM, GeoEcoMar) and of universities, were involved in many projects. We present an inventory.

EnviroGRIDS - BUILDING CAPACITY FOR BLACK SEA CATCHMENT OBSERVATION AND ASSESSMENT SYSTEM SUPPORTING SUSTAINABLE DEVELOPMENT - FP7
With 30 partners distributed in 15 countries, the enviroGRIDS project is contributing to the Global Earth Observation System of Systems (GEOSS) by promoting the use of web-based services to share and process large amounts of key environmental information in the Black Sea catchment (2.2 mio. km2, 24 countries, 160 million inhabitants). The main aim of the project is to assess water resource in the past, the present and the future, according to different development scenarios. The objective is also to develop datasets that are compatible with the European INSPIRE Directive on spatial data sharing across Europe. The data and metadata gathered and produced on the Black Sea catchment will be distributed through the enviroGRIDS geoportal. The challenge is to convince and help regional data holders to make available their data and metadata to a larger audience in order to improve our capacity to assess the sustainability and vulnerability of the environment.
The main duties of the Institute of Geography in the framework of this project (WP5 - Task 5.3Agriculture and Task 5.6 Disasters Early Warning, Sub-task 5.6.2. Invasive Terrestrial Plant Species in the Romanian protected areas) are related to:

-Setting up a GIS-based national data-base on Invasive Plant Species (ITPS) in Romania with special focus on the protected areas;
-Evaluation of the ITPS in the Romanian protected areas by identifying and analyzing the main environmental driving forces (natural and human-induced) responsible for their introduction and spread;
-Developing an invasive terrestrial plant species potential distribution model (ITPS-podismod) able to predict their distribution, spread and recurrence in the selected protected areas from the five biogeographical regions of Romania: Danube Delta Biosphere Reserve (for the pontic bioregion), Măcin Mountains National Park (for the steppic bioregion), Mureş Floodplain Natural Park (for the pannonic bioregion), Comana Natural Park (for the continental bioregion) and Rodna Mountains National Park and Maramureş Mountains Natural Park (for the alpine bioregion);
-Accomplishing a historical overview of land property and land relations in Modern Times Romania, land reforms, policy-related changes (land reforms, land use changes and dynamics, land fund under the transition to the market economy and EU accession etc.); agricultural land use by type and form of property; animal breeding;
-Modelling agri-environmental issues with the GIS-based EPIC model by identifying of important/relevant agri-environmental issues and potential impact areas by selecting relevant national level indicators in order to apply a country level GIS-based Environmental Policy Impact Calculator (GEPIC) model.

Website:

CC-Waters - CLIMATE CHANGE AND IMPACTS ON WATER SUPPLY () - SEE Project

Climate change affects fresh water resources and may have significant influence on public drinking water supply. Land use activities exert pressure on water resources and will change according to climate change. It is crucial for safeguarding future water supply to anticipate these climate and land use changes and to assess their impacts on water resources.

Transnational action is needed to prepare the South East European Space for the challenge of ensuring water supply for society for several decades. Policy makers and water suppliers are required to develop sustainable management practices for water resources, considering existing and future influences of climate change. Therefore CC-WaterS will identify and evaluate resulting impacts on availability and safety of public drinking water supply for several future decades.

Elaborated measures to adapt to those changes build the ground for a Water Supply Management System regarding optimization of water extraction, land use restrictions, and socio-economic consequences under climate change scenarios for water suppliers in SEE.

The joint actions to produce this technical system will be performed on a transnational level in the Alps, Danube Middle and Lower Plains and coastal areas representing different SEE-characteristic climates and topography.

In CC-WaterS, SEE governmental bodies, water suppliers and research institutions work together and implement jointly developed solutions, hence to be applied on a regional or local level in SEE. The complementary knowledge of the partners, enhanced by further applicable results of past projects, will provide a strong background.

Capitalising already existing knowledge and data from EU-funded scientific projects and eliminating parallel investigations, CC-WaterS will make information applicable for concrete solutions, develop tools and instruments for public water supply and implement safeguarding measures. An accessory dissemination strategy will ensure that CC-WaterS' durable results are transferred to the relevant users.

Website: www.cc-waters.eu

ECLISE - ENABLING CLIMATE INFORMATION SERVICE F0R EUROPE - FP7

Scope of ECLISE project: to take the first step towards the realisation of a European Climate Service. ECLISE is a European effort in which researchers, in close cooperation with users, develop and demonstrate local climate services to support climate adaption policies. It does so by providing climate services for several climate-vulnerable regions in Europe, organized at a sectorial level: coastal defence, cities, water resources and energy production. Furthermore, ECLISE will define, in conceptual terms, how a pan-European Climate Service could be developed in the future, based on experiences from the aforementioned local services and the involvement of a broader set of European decision makers and stakeholders. The first component of ECLISE constitutes the bulk of the project and is dedicated to the generation of climate information on four selected thematic/sectorial areas in Europe: Coasts, Cities, Water and Energy in close cooperation with local users.

• The main objectives of ECLISE are:

- To provide a European perspective to the functionality of climate services and the entrainment of national services into a broader European approach;
- To take a first step towards the realisation of a European Climate Service, addressing climate information needs of the EU and its Member States;
- To capitalize on previous research projects and bring together European climate research expertise and the needs of public and private organizations on future climate information. To further develop local climate services in four areas, Coasts, Cities, Water and Energy, and to make concrete demonstrations of the utility of these services in support of local climate adaptation policies.
- To provide an outline and proof of concept for future European-wide Climate Services.

The Institute of Geography is involved in the ECLISE project with the coordination of 3 local case studies (Baia Mare town, the Vrancea Seismogenic Region and the Baragan Plain) regarding studies on water management issues, landslide and risk assessment and the impact of climate change on urban areas.

Website:

CHANGES FP 7 Project

Between 2011 and 2014, the Institute of Geography was involved in the FP 7 Project CHANGES. The CHANGES network was develop an advanced understanding of how global changes (related to environmental and climate change as well as socio-economical change) will affect the temporal and spatial patterns of hydro-meteorological hazards and associated risks in Europe; how these changes can be assessed, modeled, and incorporated in sustainable risk management strategies, focusing on spatial planning, emergency preparedness and risk communication.

Romania hosted one of the project's four case-studies, represented by Buzau County. The researches will be conducted within the Institute of Geography and the Patarlagele Natural Hazards Research Centre.

A series of 12 Ph.D positions, financed by the European Community, were available within the European Marie Curie Initial Training Network CHANGES.

Website:

ROBUHAZ-DUN - ROMANIAN-BULGARIAN CROSS-BORDER JOINT AND TECHNOLOGICAL HAZARDS ASSESSMENT IN THE DANUBE FLOODPLAIN. THE CALAFAT-VIDIN – TURNU MĂGURELE-NIKOPOLE SECTOR

The project is aiming to improve the already existent information on natural and technological hazards on both Romania and Bulgaria border area and increase transparency in terms of availability and dissemination for all the interested actors (local government, municipalities, emergency situation inspectorates etc.). The study is planning to assess the incidence of natural and technological hazards in order to ensure environmental protection and sustainable development of the study area.

Website:

IGCP 610- From the Caspian to Mediterranean: Environmental Change and Human Response during the Quaternary

This Project will investigate the influence of environmental change on the development of humankind for the entire Caspian-Black Sea-Mediterranean Corridor ["CORRIDOR"] that encompasses the Eurasian intercontinental basins of the Caspian, Black, Marmara, Aegean, and Eastern Mediterranean seas with their connecting straits and coasts. During the Quaternary, these basins were repeatedly connected and isolated from each other. This predetermined their environmental conditions and hydrologic regimes and imposed specific impacts on diverse biological populations, including humans inhabiting the coastal domains.

Website: http://www.avalon-institute.org/IGCP610/

EUROFLEETS2 - New operational steps towards an alliance of European research fleets
EUROFLEETS2 is the enhancement of EUROFLEETS1, with the aim of developing a new pan-European distributed infrastructure with common strategic vision and coordinated access to Research Vessels (RVs) and marine equipment. EUROFLEETS2 will furthermore undertake specific actions to consolidate research fleets' organization, methodology and tools through operational initiatives (like virtual fleets) leading to more interoperable and cost effective European research fleets.

Website: http://intranet.geoecomar.ro/eurofleets2/

RISES-AM - Responses to coastal climate change: Innovative Strategies for high End Scenarios - Adaptation and Mitigation
Coastal areas concentrate vulnerability to climate change due to high levels of population, economic activity and ecological values. Because of that RISES-AM- addresses the economy-wide impacts of coastal systems to various types of high-end climatic scenarios (including marine and riverine variables). It encompasses analyses from global to local scales across the full range of RCPs and SSPs. It considers the still significant uncertainties in "drivers" (physical and socio-economic) and coastal system responses (e.g. land loss or uses, biological functions, economic productivity) within a hazard-vulnerability-risk approach

Website: **http://risesam.eu/**

FAST - Foreshore Assessment using Space Technology
Reducing flood risks is one of the most pressing challenges facing European coastal managers. Sea level rise, climate change and increasing coastal populations, intensify this challenge, demanding innovative approaches towards coastal management.
Vegetated foreshores naturally defend against coastal flooding and erosion. This means that conserving and restoring natural coastal ecosystems can play an important role in reducing flood risks, and is increasingly becoming a cost-effective flood defence solution.

FAST is a multi-disciplinary project that aims to provide answers to these questions. Using a combination of remote sensing and field data from foreshores in four different EU countries (The Netherlands, UK, Romania and Spain), FAST will look at how specific characteristics of vegetated foreshores affect wave energy and erosion and develop novel ways to get the information needed from satellite images, so as to predict shoreline protection.

Website: http://www.fast-space-project.eu/

Towards Coast to coast networks of Marine Protected Areas (from the shore to the high and deep sea), coupled with sea-based wind energy potential

Desk based research conducted - Bathymetry of Black Sea Romanian sector: compilation of GeoEcoMar data collected in the last 30 years; - Organizing database for wind, waves, water and air parameters at the offhore rig Gloria (2003-2010 years); - Digitizing and compilation of relevant existing information for habitat mapping, the Romanian and Ukrainian part of the Black Sea and (files delivered through Progecta: classification of the benthic communities for the entire Romanian part of the Black Sea, Bacescu et. al. in 1971, and the spatial dynamics of Phyllophora Field from 1950 to 1980, together PF MPA and with the planned sampling points for the PF , see images below); these information will be used for further spatial analysis - Analysis of macrobenthos – taxonomy and abundance of this group of organisms in the Black Sea Offshore Zone - Sf. Gheorghe (data from cruise 2012 – provided with the research vessel Mare Nigrum of GeoEcoMar);

Analysis of microbenthos and microplankton - taxonomy and abundance of these groups of organisms in the Black Sea Offshore Zone - Sf. Gheorghe (data from cruise 2012 – provided with the research vessel Mare Nigrum of GeoEcoMar);

- **Website:** http://www.coconet-fp7.eu/

EUSEAMAP2- "Knowledge base for growth and innovation in ocean economy: assembly and dissemination of marine data for seabed mapping"

Mapping European seabed habitats. The EMODnet portal for Seabed Habitats is a free resource for marine habitat data in Europe

Website: http://jncc.defra.gov.uk/page-5020

MERCURO- Mercury treat in industrially impacted surface water bodies in Romania – integrated approach

The overall objective of this project is to assess the impact of pollution resulting from industrial activities on the environment (water, sediment, biota - primary producers in aquatic ecosystems) and human health, both locally as well as regionally.

Website: http://intranet.geoecomar.ro/mercuro/

PERSEUS - Policy-oriented marine Environmental Research in the Southern European Seas

The overall scientific objectives of PERSEUS are to identify the interacting patterns of natural and human-derived pressures on the Mediterranean and Black Seas, assess their impact on marine ecosystems and, using the objectives and principles of the Marine Strategy Framework Directive as a vehicle, to design an effective and innovative research governance framework based on solid scientific knowledge

Website: http://intranet.geoecomar.ro/perseus/

ARCH - Architecture and roadmap to manage multiple pressures on lagoons

The ARCH research project "Architecture and roadmap to manage multiple pressures on lagoons" aims to develop participative methodologies in collaboration with policy makers, local authorities and stakeholders to manage the multiple problems affecting lagoons (estuarine coastal areas). These areas represent ecosystems that are very vulnerable for climate change, increasing urbanisation and industrialisation. A central feature of ARCH is to provide realistic solutions to manage these pressures and establish a better connection (the arch) between science and policy.

Website: http://www.arch-fp7.eu/

DANCERS - *DANube macroregion: Capacity building and Excellence in River Systems (basin, delta and sea)*

The aim of this project is develop new instruments and tools that will enhance environmental research and promote innovation in Danube Region, including the Danube Delta and the Black Sea. Importantly, the new instruments and tools do not start ab initio but will build on existing projects – covering multiple source of funding (public, private or PPP), whether national, regional or European – which will be identified and clustered. The project will undertake a critical analysis of what has been achieved so far in the region and will build upon results of achievements to-date, to design innovative solutions to strengthen knowledge transfer in this area. This will be achieved by gathering top level representatives of the academia and business communities as well as decision makers, specialized in various sectors of integrated management of the Danube –Black Sea macrosystem.

Website: http://www.dancers-fp7.eu/

Life Sedi.port.sil - Recovery of dredged SEDIments of the PORT of Ravenna and SILicon extraction

Recovery of dredged Sediments of the PORT of Ravenna and SILicon extraction

Website: http://www.lifesediportsil.eu

ARCADIS - Technical and administrative support for the joint implementation of the Marine Strategy Framework Directive (MSFD) in Bulgaria and Romania –

Building the information basis for a more coherent and comparable joint implementation of the MSFD in Bulgaria and Romania; Capacity building activities in the region with the view to sterenghtening the administrative and technical capabilities in Bulgaria and Romania for joint MSFD implementation.

Website: http://www.arcadisbelgium.be/Over_Ons.aspx

EMODNET BATHYMETRY

The EMODnet-Bathymetry portal is being developed in the framework of the European Marine Observation and Data Network (EMODnet) as initiated by the European Commission. It provides services for discovery and requesting access to bathymetric data (survey data sets and composite DTMs) as managed by an increasing number of data providers from government and research.

Website: http://www.emodnet-hydrography.eu/

HYDRALAB IV More than water; dealing with the complex interaction of water with environmental elements, sediment, structures and ice -

The co-ordinated and integrated approach of HYDRALAB aims at structuring the access to unique and costly hydraulic and ice engineering research infrastructures in the European Research Area. The network of HYDRALAB is unique in the hydraulic research community and has large experience in co-operating since its start in 1997. It began by informing and co-ordinating the activities of the partners in HYDRALAB I and II, and via strong collaboration in HYDRALAB III we will now realize further integration of our research services in Europe in HYDRALAB IV. Over the course of 10 years our network has grown from 8 participants in 1997 to a total of 30 partners and associated partners from 15 countries today.

Website: http://www.hydralab.eu

MAREAS - Black Sea Joint Regional Research Centre for Mitigation and Adaptation to the Global Changes Impact.-
It will provide a tool for interconnection of scientific community and Policy Makers, setting thus the framework for the practical implementation of several actions and initiatives concerning the mitigation of the impact of global changes in the Black Sea region.

Website: http://www.mareas-info.eu/

MISIS - MSFD Buiding Improvements In The Black Sea Integrated Monitoring System -
The overall goal of the Project Consortium is to support efforts to protect and restore the environmental quality and sustainability of the Black Sea.

The additional specific objectives of this project are:

- To improve availability and quality of chemical and biological data to provide for integrated assessments of the Black Sea state of environment, including pressures and impacts (in line with Annex I and III of the MSFD);
- To increase number and size of protected areas in the Black Sea as well as to increase their degree of protection;
- To enhance stakeholders participation and public awareness on environmental issues.

The project will contribute:

- To improving regional cooperation and agreements implementation for the protection of the Black Sea, in particular, the Convention on the Protection of the Black Sea against Pollution (the Bucharest Convention), focusing on the alignment of partner countries' policies and strategies sensu MSFD and WFD;
- To development of national integrated monitoring programs in line with the MSFD and WFD;
- To improved research and increase in knowledge on the state of the Black Sea and common understanding of GES toward development of environmental targets in a harmonised approach;
- To strengthened capacities of relevant organizations for monitoring (focus on biodiversity, habitats) in the Black Sea (via training and other capacity building measures) taking into consideration the requirements of the MSFD and WFD;
- To strengthened capacities of relevant organizations to identify, designate, and manage protected areas;
- To development of new protected areas;
- To improved stakeholders involvement and public awareness.

Website: http://www.misisproject.eu

Marine GEOHAZARDS Set-up and implementation of key core components of a regional early-warning system for marine geohazards of risk to the Romanian-Bulgarian Black Sea coastal area – Implementation of an integrated early-warning system accompanied by a common decision-support tool, and enhancement of regional technical capability, for the adequate detection, assessment, forecasting and rapid notification of natural marine geohazards of risk to the Ro-Bg Black Sea cross-border area.

Website: **http://www.geohazard-blacksea.eu**

EUROFLEETS - Towards an alliance of European Research Fleets
EUROFLEETS is a project that aims at bringing together the owners of existing European research fleet to improve their coordination and promote efficient use of their facilities in order to support effective provision of research services for monitoring and sustainable management of seas and regional oceans.

Website: http://intranet.geoecomar.ro/eurofleets

CLIMATEWATER - Bridging the gap between adaptation strategies of climate change impacts and European water policies –
Climate Water project that will introduce the major results of the project, such as

- Climate change impacts on the hydrological cycle, water resources and water management reviewed for major topic categories: Impacts on the society and economy as direct impacts on life and health of the population; Indirect impacts on the society through direct impacts on economic activities; Water related impacts on nature, terrestrial and aquatic ecosystems.
- Adaptation strategies are the most important results, being reviewed in 6 major categories: water demand side, supply side, damage prevention, main water industries, adaptive capacities and control of water pollution.
- The identified research needs, where 11 very important new or novel fields are considered, such as ecohydrology. The final output is a list of advises to upgrade water-impact related EU policies, such as a novel approach to WFD/RBMP and new strategies to flood control.

Website: www.climatewater.org/wp.php

Black Sea scientific network - Black Sea Scene
The UP-GRADE BS-SCENE project is an FP7 EU funded project running from 2009-2011 that is building and extending the existing research infrastructure (developed under FP6 project BlackSeaScene 1) with an additional 19 marine environmental institutes/organizations from the 6 Black Sea countries. Implementing FP6 RI SeaDataNet project standards regarding common communication standards and adapted technologies will ensure the datacenters interoperability. Main output will be on-line access to in-situ and remote sensing data, meta-data and products.

Website: www.blackseascene.net

ECO-SATELLITE - Developing of a common intraregional monitoring system for the environmental protection and preservation of the Black Sea (2011-2013), **BLACK SEA Crossborder Cooperation - Black Sea Joint Operational Programme**

www.ecosatellite.topo.auth.gr

BSB Net-Eco- Research networking for the environmental monitoring and mitigation of adverse ecological effects in the Black Sea Basin (2013-2015), BLACK SEA Crossborder Cooperation - Black Sea Joint Operational Programme

Website: http://www.ddni.ro/index.php?page_id=403&siteSection=2&sectionTitle=BSB%20Net-Eco%20News

MARS - Managing Aquatic ecosystems and water Resources under multipls Stress (2014-2018), *Grant agreement no. 603378, FP7 – ENV*
We investigate how multiple stressors affect rivers, lakes and estuaries. Formerly, rivers and lakes were impacted by strong, single stressors, e.g. by organic pollution or acidification. They were replaced by a complex mix of stressors resulting from urban and agricultural land use, water power generation and climate change.

Website: www.mars-project.eu.net

EnviroGRIDS - Building Capacity for a Black Sea Catchment Observat and Assessement System supporting Sustainable Development (2009-2013), **Theme 6 -** Environment (including climate change)

With 30 partners distributed in 15 countries, the enviroGRIDS project is contributing to the Global Earth Observation System of Systems (GEOSS) by promoting the use of web-based services to share and process large amounts of key environmental information in the Black Sea catchment (2.2 mio. km^2, 24 countries, 160 million inhabitants). The main aim of the project is to assess water resource in the past, the present and the future, according to different development scenarios. The objective is also to develop datasets that are compatible with the European INSPIRE Directive on spatial data sharing across Europe. The data and metadata gathered and produced on the Black Sea catchment will be distributed through the enviroGRIDS geoportal. The challenge is to convince and help regional data holders to make available their data and metadata to a larger audience in order to improve our capacity to assess the sustainability and vulnerability of the environment.

Website: http://www.envirogrids.net/

PEGASO Project

Many efforts have been deployed for developing Integrated Coastal Zone Management in theMediterranean and the Black Sea.

Both basins have, and continue to suffer severe environmental degradation. In many areas this has led to unsustainable trends, which have impacted, on economic activities and human well-being. An important progress has been made with the launch of the ICZM Protocol for the Mediterranean Seain January 2008.

The main goal of the PEGASO project is to construct a shared Integrated Coastal Zone Management (ICZM) Governance Platform (figure 1) with scientists, users and decision-makers linked with new models of governance.

- www.pegasoproject.eu

DELTANET - Network of European Delta Regions - Sustainable Delta Governance (2010-2013)

The DeltaNet project started in March 2010 and continues until February 2013.

The principal objective of DeltaNet is to set up a learning and policy network of European delta regions.

The issue adressed is ‘developping appropriate coordinated spatial planning measures in geographically sensitive areas’. The European delta regions are geographically sensitive areas sharing many similar characteristics, problems and challenges. The delta and estuary regions are faced with a dynamic development and are often characterized by both concentration of population and economic activities, and natural and cultural heritage values. The many spatial and economic demands often threaten a sustainable development. Delta regions are becoming a kind of laboratory where different stakeholders, regions and countries are working together to achieve a sustainable spatial, economic and social development.

The planned exchange of best practices activities are organised around 5 successive sub-themes: Integrated Delta approach (1), Flood & sediment management (2), environmental healthy Deltas (3) and Delta awareness (4), always seen from the view of developping appropriate coordinated spatial plannig measures. The 5th period of activities will gather the results of the sub-themes and integrate them into Sustainable Coordinated Delta Policy (5).

Website: http://www.deltanet-project.eu/

CARTODD - Develop a high-resolution digital cartographic support needed to implement plans, strategies and management schemes in the Danube Delta Biosphere Reserve (2009-2012)

Website: www.ddni.ro/cartodd
www.youtube.com/watch?v=Zcx6vKpCMhw

Transboundary Ukrainian-Romanian-Moldavian Survey in the Danube Delta (Joint Danube Delta Survey)

The Joint Danube Delta Survey (JDDS) was held during the period from September 26th till October 7th 2011 within the project **"Joint environmental monitoring, assessment and exchange of information for integrated management of the Danube delta region"** with the assistance of scientists from Ukraine, Romania and Moldova

COCONET -Towards COast to COast NETworks of marine protected areas (from the shore to the high and deep sea), coupled with sea-based wind energy potential , FP7
The project has two main themes:
Identify prospective networks of existing or potential MPAs in the Mediterranean and the Black Seas, shifting from a local perspective to the regional level (network of MPAs) and finally the basin scale (network of networks). The identification of the physical and biological connections among MPAs will elucidate the patterns and processes of biodiversity distribution. Measures to improve protection schemes will be suggested based on maintaining effective exchanges (biological and hydrological) between protected areas.
Explore where OWF might be established, producing an enriched wind atlas both for the Mediterranean and the Black Seas. OWF locations will avoid too sensitive habitats but the possibility for them to act as stepping-stones through MPAs, without interfering much with human activities, will be evaluated.
Website: www.coconet-fp7.eu

PERSEUS - **Policy oriented environmental research in the southern European Seas, FP7, 2012-2015,**
The overall scientific objectives of PERSEUS are to identify the interacting patterns of natural and human-derived pressures on the Mediterranean and Black Seas, assess their impact on marine ecosystems and, using the objectives and principles of the Marine Strategy Framework Directive as a vehicle, to design an effective and innovative research governance framework based on sound scientific knowledge

- **www.perseus-net.eu**

SeaDataNeII, **Pan-European infrastructure for ocean and marine data management, 2011-2015**
The overall objective of the SeaDataNet II project is to upgrade the SeaDataNet infrastructure into an operationally robust and state-of-the-art Pan-European infrastructure for providing up-to-date and high quality access to ocean and marine metadata, data and data products originating from data acquisition activities by all engaged coastal states, by setting, adopting and promoting common data management standards and by realizing technical and semantic interoperability with other relevant data management systems and initiatives on behalf of science, environmental management, policy making, and economy.
SeaDataNet is a standardized system for managing the large and diverse data sets collected by the oceanographic fleets and the automatic observation systems. The SeaDataNet infrastructure networks and enhances the currently existing infrastructures, which are the national oceanographic data centres of 35 countries, active in data collection. The networking of these professional data centres, in a unique virtual data management system provide integrated data sets of standardized

quality on-line. As a research infrastructure, SeaDataNet contributes to build research excellence in Europe.provision capacities in close cooperation with MyOcean, EuroGOOS, its Regions (ROOSes), and other oceanographic monitoring agencies and systems.

- www.seadatanet.org

EAFM - <u>MareFrame seeks to remove barriers that currently prevent a more widespread use of an Ecosystem-based Approach to Fisheries Management</u> FP7, 2012-2014

The project delevops:
Novel data based on new tools and technologies;
Ecosystem models and assessment methods based on indicators of Good Environmental Status (GES);
A Decision Support Framework (DSF) adapted to the needs of decision makers, managers, operators, and other stakeholders that will support the implementation of the new Common Fisheries Policy (CFP), Marine Strategy Framework Directive (MSFD) and Habitats Directive (HD).

Website: www.mareframe-fp7.org

<u>Risques associés au système hydro-géomorphologique et aménagement du territoire</u> (2011-2012), bilateral project Brâncuşi – Egide, in cooperation with Paris 7 *Denis Diderot* University.
Directors : Liliana Zaharia et Gérard Beltrando.

The project developed in the *Brâncuşi* program, inside the Hubert Curien (PHC) Romanian-French partnership, whose overall objective is to develop scientific and technological exchanges between research laboratories of the two countries. This project was carried out over two years (2011 and 2012) and the partner teams were the University of Bucharest (Faculty of Geography) and UMR 8586 (Prodigal) of the CNRS (France).

The project **general aim** was a transdisciplinary analysis, of the risks induced by hydro-climatic and hydro-geomorphological hazard (floods, flooding, river dynamics) and the way they are managed. The analysis focused on the Carpathians Curvature region, including the plain areas (belonging to the Romanian Plain), a region with important social and economical stakes. The results of this project represent a theoretical and methodological support for hydro-morphological and water related hazards and for the implementation and/or improvement of measures to mitigate the risk.

The main results ofresearchcarried out in the project, can be found, whole or in part, in different types of scientific works, made bymembers of the tworesearh teams: PhD thesis,master degree dissertation, publications, presentations ininternational scientific conferences, as follows: a doctoral thesisininternationaljoint degrees, which will be held in2013,titled *Study offlood riskon theSiret River (Romania):hydro-climatologicalapproachanddiachronic analysis of flood risk management*, author FlorenceSalit; a doctoral thesisin Romania, heldin September 2011, entitled*Bâsca River's Catchment. Hydrographical study*, author MineaGabriel; amaster degree dissertationheld in June 2012withthe titled Natural hazards in Zăbrăuţi and Şuşiţa Catchments, author CiobotaruNicu; 6publications inISI journalsand 7in otherinternational databasesknown;17publications(articles,abstracts)in other journals, volumes of proceedings/abstracts,papers involume; 20 participationsatinternationalscientific conferences with oral presentations(22)and posters(8).

Climate changes and hydrological impacts in the Romanian Carpathians, Sciex-NMSch bilateral project, in collaboration with University of Lausanne (2012 – 2013). Directors/Mentors: Zaharia Liliana and Stuart Lane.

The Scientific Exchange Programme (Sciex-NMSch) aims at contributing to the reduction of economic and social disparities in the enlarged European Union through fostering the scientific capacities of researchers in NMS and promoting sustainable research partnerships between the ten NMS and Switzerland. The proposed project had as a general objective the analysis of the temporal variability of the main climatic parameters and the impact on the water balance/ water resources/ hydrological response in the Bucegi Mountains a mountainous division of the Romanian Carpathians. The hydrological model WaSim-ETH has been applied

to Valea Cerbului Catchment and coupled to both contemporary hydrological data and climate projections. The model is able to simulate the partition of rainfall into solid and liquid forms, snow accumulation and melt, the runoff process, and routing of water into the stream network. Climate scenario data were downscaled and disaggregated for the basin until 2100 and applied to the model. Analysis of predictions suggests an increased in drought frequency but a reduction in flood frequency during the 21st century and these changes were shown to be statistically significant given uncertainties in model predictions. The changes were shown to be related to temperature forcing. A progressive reduction in the amount of rainfall that falls as snow as well as the earlier onset of snow melt reduces the total snow accumulation in the basin at the end of the winter period. The annual maximum flows predicted are strongly correlated with accumulated snow depth because significant end of winter snow accumulation increases the probability of a rain-on-snow spring/summer event, and the greatest magnitude river flows. In turn, lower snow accumulations reduce the extent to which base flows are sustained in the summer, leading to longer (if not deeper) periods of drought during the summer months. This was the first hydrological analysis of this kind for the Carpathians. The work undertaken has allowed a substantial transfer of expertise in hydrological modeling from Switzerland to Romania.
The projectfunded a PhD fellowship (Perju Ruth).

The vulnerability of communities and of the environment to floods in Romania in the context of global environmental changes, Contract no. 52/2012, Program *Partnerships inpriority areas*, axis 3 – Environment; (IGAR); 2012-2016.
The project has as coordinator the Institute of Geography of the Roanian Academy and includes as partners National Institute of Hydrology and Water Management, University of Bucharest – Faculty of Geography and INCDO-INOE 2000, BRANCHResearch Institute forAnalytical Instrumentation CLUJ-NAPOCA.
The main objective of the VULMINis toprovidescientific services to stakeholders at different levelsofadministrationon thevulnerability to floods of the population,settlements andthe environment, in order toincrease theresilience ofcommunities andthe environment inareas affectedorexposed tofloodingand toimprove theadaptation of these phenomena.

Streams-2-Suppress-Fires Utilizing stream waters in the suppression of forest fires with the help of new technologies, *cod 2.2.2.73841.323_MIS-ETC 2666; 2013 – 2015.*
Main contractor: The Joint Operational Programme Black Sea Basin 2007- 2013 within the Ministry of Regional Development and Public Administration.
Partners: Greece, Ukraine, Romania, Turkey, Moldova, Armenia.

- **http://suppressfires.eu/index.php**

DANUBE FLOODRISK - Stakeholder oriented flood risk assessment for the Danube Floodplains (2009-2012)
Developed hazard and risk maps along the Danube, using a common methodology
A transnational, interdisciplinary and stakeholder-oriented approach was key for adequately assessing and mapping flood risk. And due to the many actors involved in flood risk management, harmonization was a key feature of the project. This “common interpretation” of events covered the specification of the goals and tackled key technical questions. DANUBE FLOODRISK has resulted in better socio-economic conditions in the Danube basin and less flood damage to its floodplain. The project has also improved the common geodatabase for flood and risk mapping along the Danube floodplains.

Website: www.danube-floodrisk.eu

FLOOD CBA, (2013-2015)
FLOOD-CBA project aims at establishing a sustainable Knowledge Platform for the use of stakeholders dealing with the cost-benefit analysis of flood prevention measures in the context of different socio-economic environments within the EU.
Furthermore the proposed project intends to:

a) Facilitate the collection, assessment and the exchange of information amongst stakeholders (i.e. responsible authorities, technical services and scientific community) and provide overview and detail on current models and best practices;
b) Consolidate the methodology and data sources and enhance the comparability of results of Cost-Benefit Analysis;
c) Strengthen the performance of the existing prevention mechanism especially in the project participating countries;
d) Promote the transnational cooperation of competent bodies all over Europed) Promote the transnational cooperation of competent bodies all over Europe

Website: www.flood-cba.eu

Danube WATER integrated management (WATER). MIS-ETC code: 161 (2012-2015)
The general objective is to create a common management and monitoring system for water quality in extreme environmental conditions (floods, droughts, accidental pollution by chemical and radioactive substances), including providing a data and information dissemination mechanism, necessary for the regional development of the border area.

Website: www.danube-water.eu

EAST AVERT - The prevention and protection against floods in the upper Siret and Prut River Basins, through the implementation of a modern monitoring system with automatic stations (2012-2015)
The protection of the border areas against the flood risk through preventive measures. The specific objectives are:
1.Ensuring of a high quantitative monitoring level of the Siret and Prut River Basins, including the main hydraulic infrastructures as Stanca Costesti Dam and Reservoir for prevention and protection against floods and accidental pollution events; 27 automate stations will be installed, 8 counties dispatches.
2. Reducing the environmental, economic and social vulnerability of targeted localities from the border region between the Republic of Moldova and Romania against flood risk by enhancing the functional capacities of the Hydro-technical Complex "Stanca-Costesti".
3. The elaboration of the maps representing the flooded areas during the historical flood events in the Siret and Prut River Basins, of the hazard and vulnerability maps at a global scale (using the high-resolution satellite images) and of the risk maps for Siret and Prut River Basin;
4. Providing of the ***River Basin Plan for the protection against ice-floods, hydrological drought, accidents occurred at the hydrotechnical constructions and accidental pollutions*** for the Siret and PrutRiver Basins.
5. Improving the warning system by a better common forecasting procedures and modeling
6. Increasing the reaction capacity by a better data and forecasts dissemination, public information about flood hazard and risk and a common exercise, testing the hydrological information system.

- **www.east-avert.eu**

Chapter 5. Publications on journals and national and international scientific conferences proceedings.

Articles published in journals

2012

Adler M .J., Mareş C., Mic R.P., Oprişan E., Corbuş C., Măreaţă M., Chendeş V., Stănescu G., Teodor S., (2012), *INHGA contribution to CLIMHYDEX project -„Changes in climate extremes and associated impact in hydrological events in Romania.* INHGA International Scientific Conference "Hydrological Hazards and Associated Risks Management", Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 25-30)

Adler M .J., Bica I., Groza I., Hoogmoed M., Smidt E., (2012), *Integrated water security and buffer management requires new research programs.* INHGA International Scientific Conference "Hydrological Hazards and Associated Risks Management" / "Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 177-182)

Adler M .J., (2012), *Danube Floodrisk Project outputs and outcomes.* INHGA International Scientific Conference "Hydrological Hazards and Associated Risks Management", Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 383-402)

Adler M .J., *Direcţii de cercetare ale Institutului Naţional de Hidrologie și Gospodărirea Apelor,* Revista „Viitura", nr. 4, decembrie 2012, ISSN: 2067 – 7413, p1-12

Bîrsan Marius-Victor, Liliana Zaharia, Viorel Chendeş, Emilia Brănescu, 2012, Recent Trends In Streamflow In Romania (1976–2005), Romanian Reports in Physics, Vol. 64, No. 1, 275–280 (Impact factor 1,123) http://rrp.infim.ro/2012_64_1/art24Birsan.pdf

Birsan, M.V., Zaharia, L., Chendeş, V., Branescu, E. (2012) Recent trends in streamflow in Romania (1976-2005), Rom. Rep. Phys., 64(1), 275-280.

Bondar Constantin, Gabriel Iordache, (2012), Expanding the past (until 1840) of daily water levels and flows of the Danube gauging stations and sections on the Romanian border. INHGA International Scientific Conference "Hydrological Hazards and Associated Risks Management" / "Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 117-130)

Borcan Mihaela, Gabriel Nedelcu, Cătălina Petre, (2012), The analysis of the 2012 hydrological drought event among the driest periods that affected the southern part of Romania. INHGA International Scientific Conference "Hydrological Hazards and Associated Risks Management" / "Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 31-38)

Borcia Constantin, Roxana Bojariu, Andreea Elena Dobrinescu, Roxana Diana Cică, Marius Bîrsan, Alexandru Dumitrescu, Sorin Mihăiţă Teodor, Emilia Brănescu, Aurelia Berghezan, Carmen Rădulescu , Carmen Petrea, Viorel Blendea, (2012), Evidence of climatic and hydrological hazards in Danube region and over Romanian confluence areas for Danube tributaries. INHGA International Scientific Conference "Hydrological Hazards and Associated Risks Management" / "Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 143-158)

Borcia Constantin, Sorin Teodor, Carmen Rădulescu, Carmen Petrea, Viorel Blendea, (2012), Aspects of the manifestation of hazards on the Danube. INHGA International Scientific

Conference “Hydrological Hazards and Associated Risks Management” / "Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 131-142)

Broderick CRAWFORD, Carlos CASTRO, Eric MONFROY, Ricardo SOTO, Wenceslao PALMA, Fernando PAREDESDynamic Selection of Enumeration Strategies for Solving Constraint Satisfaction Problems, pp. 106–128, ROMANIAN ACADEMY**,** SECTION FOR INFORMATION SCIENCE AND TECHNOLOGY, Volume 15, Number 2, 2012

Carsmariu Alexandru, Victor Dumitrescu, Adrian Barbieru, (2012), Proposals of themes on the research and analysis of rare hydrological phenomena as regards the mitigation of the effects generated. INHGA International Scientific Conference “Hydrological Hazards and Associated Risks Management”, Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 5-24)

Chelcea Silvia, Mary-Jeanne Adler, (2012), The relationship between meteorological and hydrological drought of Barlad River. INHGA International Scientific Conference “Hydrological Hazards and Associated Risks Management”, Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 39-52)

Cioaca (E.), BONDAR (C.), BORCIA (C.), MIERLA (M.), INCE (A.), 2012 – Hydraulic model to assess the hydromorphological changes within the Danube Delta. IN: Scientific Annals of the Danube Delta Institute, vol. 18, paginile 303 – 310. Tulcea, România. DOI: 10.7427/DDI.18.21; ISSN 1842 - 614X; e-ISSN 2247 – 9902; IC2011 TM 5.09

Cioacă E., Bondar C., Borcia C., Mierla M., Ince A., 2012, Hydraulic model to assess the hydromorphological changes within the Danube Delta. IN: Scientific Annals of the Danube Delta Institute, vol. 18, paginile 303 – 310. Tulcea, România. DOI 10.7427/DDI.18.21; ISSN 1842 - 614X; e-ISSN 2247 – 9902; IC2011 TM 5.09

Ciugulea Oana Ștefania, Dragoș Găitanaru, Irina Șerpescu, (2012), The study of the interaction between groundwater and surface water for a pilot area in Bucharest City. INHGA International Scientific Conference “Hydrological Hazards and Associated Risks Management” / "Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 203-212)

Constantinescu Adrian, Iulian Nichersu, Ion Grigoraș, Cristian Trifanov, (2012), Mapping the Hazard Flood Maps for the Romanian Danube Floodplain. INHGA International Scientific Conference “Hydrological Hazards and Associated Risks Management”, Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 373-382)

Contescu Lorin 600 milion years of climate change; a critique of the anthropogenic global warming hypotesis from a time-space perspective, 2012, GeoEco Marina, No 18

Copăcean Loredana, Silvica Oncia, Iacob Borza, (2012), Analysis of water flow and volume on the upper and middle river Bega in 2010 and 2011. INHGA International Scientific Conference “Hydrological Hazards and Associated Risks Management”, Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 309-316)

Corbuş Ciprian (2012) Contribuţii la aplicarea teoriei sistemelor la modelul Muskingum de propagare a viiturilor. Revista „Viitura”, nr. 3, iunie, ISSN: 2067 – 7413, p. 23-25

Corbuş Ciprian, Gabriel Nedelcu, Paula-Cristina Andreiu, Rodica Dinu, (2012), Considerations for computing of the design floods in river basins with non-permanent reservoirs. INHGA International Scientific Conference “Hydrological Hazards and Associated Risks Management”, Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 357-364)

Corbuş Ciprian, Rodica Paula Mic, Marius Mătreaţă, Viorel Chendeş, Climate change impact upon maximum flow in Siret river basin. 12th International Multidisciplinary Scientific GeoConference SGEM 2012, Conference Proceedings, Volume III, June 17-23, 2012, Albena, Bulgaria, pp. 587-594

Costache R., Prăvălie R. (2012), The use of GIS techniques in the evaluation of the susceptibility of the floods' genesis in the hydrographycal basin of Bâsca Chiojdului river, Analele Universității din Oradea, Seria Geografie, Year XXII, Nr. 2, pp. 284-293. (indexed B+) http://geografie-uoradea.ro/Reviste/Anale/Art/2012-2/AUOG_593_Costache.pdf

Davidescu Şerban, Andrei Adorjani, Cezar Ungurean, Nicu Constantin Tudose Adriana Agafia Davidescu, (2012), Torrent – control structures used to improve torrential streams within national forest patrimony and their behaviour during service . INHGA International Scientific Conference "Hydrological Hazards and Associated Risks Management", Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 317-326)

Doroftei (M.), Mierla (M.), 2012 – Danube Delta habitats vs climate change. IN: Conference proceedings - V International Scientific Conference on Water, Climate and Environment (28 V – 2 VI 2012, Ohrid, Macedonia).

Dragota (C.-S.), Grigorescu (I.), Dumitrascu (M.), Doroftei (M.), Mierla (M.), 2012 – Integrating Key Climatic and Meteorological Drivers in Assessing the Dynamics of Invasive Terrestrial Plant Species in Danube Delta Biosphere Reserve, Romania. IN: Conference proceedings - V International Scientific Conference on Water, Climate and Environment (28 V – 2 VI 2012, Ohrid, Macedonia).

Dragota (C.-S.), Grigorescu (I.), Dumitrascu (M.), Doroftei (M.), Mierla (M.), 2012 – Key climate features to suport biological diversity in a Natura 2000 site: ROSPA0106 Lower Olt Valley. IN: International Conference "Water resources and wetlands". Conference proceedings – 14-16 September 2012, Tulcea, Romania, paginile 282 – 289. Edit. Transversal. Târgoviște, Romania. ISBN 978-606-605-038-8

Drobot Radu, Aurelian Florentin Draghia, 2012 – Design Floods obtained by statistical processing. 24th Congress on Large Dams. Q 94. Kyoto, Japan.

Drobot Radu, Aurelian Florentin Draghia, Maria Cheveresan, 2012 – Strategies for lowering the Danube water level during floods to protect Galato town (Romania). Balwois 2012 International Conference, May, 2012, Ohrid, Macedonia.

Drobot Radu, Aurelian Florentin Draghia, Maria Cheveresan, Mary-Jeanne Adler, Sorin Randasu, 2012 – The stakeholders in the lower Danube and the residual risk. International workshop: Stakeholder Involvement in the Flood Risk Management. Bucharest, Romania.

Drobot Radu, Construirea curbelor IDF (Intensitate-Durata-Frecevnta). Rev. Hidrotehnica, nr.6, 2011

Drobot Radu, János A. Szabó, Aurelian Florentin Draghia, Gábor Bálint, 2012, Different approaches for obtaining design flood peak discharges. XXVth Conference of Danubian countries. Budapest. Hungary.

Drobot Radu, Péter Szucs, Serge Brouyère, Marin-Nelu Minciuna, Lászlò Lenart, Alain Dassargues – Hydrogeological Study of Somes-Szamos Transboundary Alluvial Aquifer. Published in: „Transboundary Water Resources Management – A multidisciplinary approach". Edited by: J.Ganoulis, A. Aureli and J. Fried. Willey – VCH Verlag Co, Germany, 2011, p. 136-142. ISI paper.

Dumitru Ioane, Florina Chitea - ERT and VES studies for thermo-mineral water in Toplita area, Romania, 2012, GeoEco Marina, No 18

Freyhof Jörg, BROOKS Emma, SUCIU Radu, 2012, European Red List of Freshwater Fishes, No. of pages: 60 (+ viii + 4 pp cover. 210 x 297 mm), ISBN 978-92-79-20200-1, Publishing house: Publication Office of the European Union, Luxembourg

Gălie Andreea-Cristina, Daniela Rădulescu, Ileana Tănase, (2012), Comparative analysis of environmental flows obtained by applying national and international methods. INHGA International Scientific Conference "Hydrological Hazards and Associated Risks Management" / "Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 53-64)

Gălie Andreea-Cristina, Elisabeta Cserwid, Marinela Moldoveanu, Ecaterina Luca, (2012), RESTORE PROJECT (Rivers: Engaging, Supporting and Transferring knOwledge for Restoration in Europe) - Activities and preliminary results. INHGA International Scientific Conference “Hydrological Hazards and Associated Risks Management”, "Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 111-116)

Gălie Andreea-Cristina, Florentina Işfan, Alexandru Moldoveanu, Alina Tereza Lazarine, (2012), Project “SEE HYDROPOWER, targeted to improve water resource management for a growing renewable energy production” - Activities and preliminary results. INHGA International Scientific Conference “Hydrological Hazards and Associated Risks Management” / "Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 99-110)

Godea Marian, Laura Mititelu, (2012), Between drought and floods. Peculiarities of the water flow in Candesti Piedmont”. INHGA International Scientific Conference “Hydrological Hazards and Associated Risks Management” / "Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 89-98)

Grecu F., Carablaisă S., Zaharia L. , Gabriela Ioana-Toroimac, 2012, Les précipitations – facteur de la dynamique des versants dans le défilé Du Danube (Roumanie), XXVeme Colloque de l’Association Internaltionale de Climatologie, „Les climats regionaux: observation et modelisation”, Grenoble (Franta), p. 349 – 354, ISBN 978-2-907696-18-0.

Grecu Florina, Liliana Zaharia, Cristina Ghiţă, Laura Comănescu, Emil Cârciumaru, Maria Albu (Dinu), 2012, Sisteme hidrogeomorfologice din Câmpia Română. Hazard - vulnerabilitate – risc, Ed. Universităţii din Bucureşti, 308 p., ISBN: 978-606-16-0175-2.

Grigoras (I.), 2012 – Using remote sensing to analyze hydro-morphological changes on Danube Delta Biosphere Reserve coast line. IN: Scientific Annals of the Danube Delta Institute, vol. 18, paginile 319 – 324. Tulcea, România. DOI: 10.7427/DDI.18.23; ISSN 1842 - 614X; e-ISSN 2247 – 9902; IC2011 TM 5.09

http://ocs.balwois.com/index.php?conference=BALWOIS&schedConf=BW2012&page=paper&op=view&path[]=595&path[]=259

Ionita M., G. Lohmann, N. Rimbu and S. Chelcea, Interannual Variability of Rhine River Streamflow and Its Relationship with Large-Scale Anomaly Patterns in Spring and Autumn, J. Hydrometeor, Vol. 13, No. 1, pp. 172-188, doi:10.1175/JHM-D-11-063.1, 2012, impact factor 2.185 - publicatie ISI

Ionita M., G. Lohmann, N. Rimbu and S. Chelcea, Interannual Variability of Rhine River Streamflow and Its Relationship with Large-Scale Anomaly Patterns in Spring and Autumn, J. Hydrometeor, Vol. 13, No. 1, pp. 172-188, doi:10.1175/JHM-D-11-063.1, 2012, impact factor 2.185 - publicatie ISI

Ionita M., N. Rimbu, S. Chelcea, Simona Patrut, Multidecadal variability of summer temperature over Romania and its relation with Atlantic Multidecadal Oscillation, Theoretical and Applied Climatology, DOI:10.1007/s00704-012-0786-8, 2012, impact factor 1.942 – publicatie ISI

Ionita M., N. Rimbu, S. Chelcea, Simona Patrut, Multidecadal variability of summer temperature over Romania and its relation with Atlantic Multidecadal Oscillation, Theoretical and Applied Climatology, DOI:10.1007/s00704-012-0786-8, 2012, impact factor 1.942 – publicatie ISI

Iulian Nichersu, Marian Mierlă, Eugenia Marin, Cristian Trifanov, Iuliana Nichersu, (2012), Application of the Sketch Match method in Giurgiu case study within the DANUBE FLOODRISK PROJECT. INHGA International Scientific Conference “Hydrological Hazards and Associated Risks Management”, Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 365-372)

Jipa Dan C. Coarsening upward sedimentation in the Middle Pontian Dacian Basin, prograding shoreline or delta front?

Lenhardt (M.), Navodaru (I.), , 2012 - Fish stock management cooperation in the Lower Danube Region: a case study of sturgeons and Pontic shad. Capitolul 7, paginile 127 – 140. ÎN: V. Lagutov (ed.), Environmental Security in Watersheds: The Sea of Azov. NATO Science for Peace and Security Series C: Environmental Security, 2012, Part 2 (Hard copy: 1st Edition, 2012, vol. XVI, 253 pagini. 58 illustratii. Hardcover. ISBN 978-94-007-2459-4)

Marin (E.), Nichersu (I.), Mierla (M.), Trifanov (C.), Nichersu (I.), 2012 – Examples and lessons for best practices for Danube River revitalisation. IN: Scientific Annals of the Danube Delta Institute, vol. 18, paginile 235 – 240. Tulcea, România. DOI: 10.7427/DDI.18.14; ISSN 1842 - 614X; e-ISSN 2247 – 9902; IC2011 TM 5.09

Marinov (M. jr.), KISS (J. B.), TOMAN (A.), POLEDNIK (L.), ALEXE (V.), DOROFTEI (M.), DOROŞENCU (A.), KRANZ (A.), 2012, Monitoring of European Mink (Mustela lutreola) in the Danube Delta Biosphere Reserve – Romania, 2003-2011. Current status and setting of goals for the European Mink conservation. IN: Scientific Annals of the Danube Delta Institute vol. 18, paginile 69 – 74. Tulcea, România. DOI: 10.7427/DDI.18.07; ISSN 1842 - 614X; e-ISSN 2247 – 9902; IC2011 TM 5.09

Marinski Jordan, Tania FLOQI, Gergana DROUMEVA, Tania BRANCA, Albena VATRALOVA, 2012, Environmental improvement with additional instruments for environmental protection in port areas, , 2012, GeoEco Marina, No 18

Maris Izabela The sedimentology of the Upper Cretaceous continental deposits from the south-western part of the Transylvanian Basin, the Șard Formation, , 2012, GeoEco Marina, No 18

Mateescu Răzvan, Viorel Malciu, Dan Diaconeasa, Alina Spinu, (2012), Evaluation Functional Effectiveness of the Coastal Facility on Romanian Touristic Littoral, Base of the Present Master Plan for Protection Extensions. INHGA International Scientific Conference “Hydrological Hazards and Associated Risks Management”, Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 283-286)

Mătreață Marius, Simona Mătreață, Constantin Magetz, Dali Apostu, (2012), ROFFG System – design, implementation and preliminary assessment. INHGA International Scientific Conference “Hydrological Hazards and Associated Risks Management”, Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 249-260)

Mic Rodica, Ciprian Corbuş, Prognoza debitelor maxime în cazul viiturilor rapide. Revista „Viitura”, nr. 4, decembrie 2012, ISSN: 2067 – 7413, p. 22-27

Mic Rodica-Paula, Ciprian Corbuș, (2012), Calibration of the WatBal model parameters in the Somes river basin by simulating average monthly flow / Calibrarea parametrilor modelului WatBal în bazinul hidrografic Someș prin simularea scurgerii medii lunare. INHGA International Scientific Conference “Hydrological Hazards and Associated Risks Management” / "Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 169-176)

Mierla (M.), NICHERSU (I.), MARIN (E.), TRIFANOV (C.), NICHERSU (I.), 2012 – Draft algorithm for Danube River Revitalization. IN: Scientific Annals of the Danube Delta Institute, vol. 18, paginile 241 – 248. Tulcea, România. DOI: 10.7427/DDI.18.15; ISSN 1842 - 614X; e-ISSN 2247 – 9902; IC2011 TM 5.09

Mierla (M.), ROMANESCU (G.), 2012 – Method to assess the extreme hydrological events in Danube fluvial delta. IN: Conferința “Aerul și Apa – component ale mediului” (23 – 24 martie 2012, Cluj Napoca, România), paginile 149 – 156. Editura Universității Babeș-Bolyai, Cluj Napoca, Romania. ISSN: 2067-743X

Minea Gabriel Gabriel, Mihaela Borcan, Liliana Zaharia, Geanina Neculau, 2012, Trends in suspended loads and the bad dynamics in the external Carpathians Curvature region, International Conference: „Understanting Land, People and Environment: Research and Teaching perspectives in Geography”, Bucharest University, 2012

Moldoveanu Alexandru, Bogdan Popa, “Evaluarea potenţialului hidroenergetic al râului Prahova cu instrumentul informatic Vapidro-Aste” publicat in Revista Energetica, Volumul 60, nr. 07/2012, ISSN: 1453-2360

Munteanu Tudor, George Dumitraşcu, Doina Drăguşin, (2012), Some peculiarities of the aquifer located in Călimani Mountains’ south-western part. INHGA International Scientific Conference “Hydrological Hazards and Associated Risks Management” Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 193-202)

Nastase (A.), 2012 - New data concerning fish fauna from lakes of the fluvial Danube Delta (Gorgova-Uzlina and Sontea-Furtuna lake-complexes, Romania) in 2010. IN: Scientific Annals of the Danube Delta Institute, vol. 18, paginile 75 – 88. Tulcea, România. DO 10.7427/DDI.18.08; ISSN 1842 - 614X; e-ISSN 2247 – 9902; IC2011 TM 5.09

Navodaru (I.), BOZAGEVICI (R.), MARIN (E.), BOTA (D.), 2012 (first-online) - The Case study in Sfântul Gheorghe Commune, Romania. Capitolul 16, paginile 190 - 194. ÎN: Papathansiu (J.), MANOS (B.) Arampatyis (S.), Kenward (R.) Transactional Environmental Support System Design: Global Solutions, IGI Global. 313 pagini. doi: 10.4078/978-1-4666-2824-3.ch016

Onara (D.), Taflan (E.), Cocias (Şt.), 2012 - Comparative genetic diversity study of two European populations of pikeperch using PCR-RFLP. IN: Scientific Annals of the Danube Delta Institute, vol. 18, paginile 203 – 210. Tulcea, România. DOI: 10.7427/DDI.18.10; ISSN 1842 - 614X; e-ISSN 2247 – 9902; IC2011 TM 5.09

Păduraru Cristian, Corneliu Cismaru, (2012), Study of diffuse pollution in the catchment area Bahluieţ: modelling nutrients- the nitrogen and phosphorous, which migrate from the catchment to the watercourse Bahluieţ at the surface or in the ground of soil. INHGA International Scientific Conference “Hydrological Hazards and Associated Risks Management” / "Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 65-76)

Păduraru Cristian, Corneliu Cismaru, (2012), The study of diffusion and dispersion phenomena of the oxygen indicators and nitrogen nutrients by the waste water treatment plant effluent of Târgu Frumos City in the Bahluieţ. INHGA International Scientific Conference “Hydrological Hazards and Associated Risks Management” / "Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 77-88)

Panin Nicolae, Gheorghe OAIE , Adrian STĂNICĂ - The National Institute of Research and Development for Marine Geology and Geoecology – GeoEcoMar: Twenty years of scientific activity, 2012, GeoEco Marina, No 18

Panin Nicolae, Willem OVERMARS - The Danube Delta evolution during the Holocene: Reconstruction attempt using geomorphological and geological data and existing cartographic documents, , 2012, GeoEco Marina, No 18

Patrut (S.M.), Constantinescu (A.), 2012 – The analyse of the flood regime in the lower course of the Danube River for sector Ghidici-Corabia. IN: Romanian Reports in Physics, vol. 64, No.1, paginile198 – 210. Bucharest (ISI20110,2)

Petre Catalina, Alexandru Nedelea, Laura Comanescu, Anca Munteanu, Terrain susceptibility to geomorphological processes and their impact on tourism infrastructure in Sambata Valley (Fagaras Mountains, Romania), Procedia Environmental Sciences vol. 14, ISBN 1878-0296, vol. 14 2012, Pages 257–266, Elsevier Ltd. Selection

Pompiliu Miţă, Simona Mătreaţă, (2012), A manner of establishing some external values of the maximum discharges in small basins. INHGA International Scientific Conference “Hydrological Hazards and Associated Risks Management”, Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 337-346)

Radu Emil, Ebel Smidt, Mary-Jeanne Adler, Ruxandra Balaet, Rodica Macalet, Dumitru Neagu, Florentina Nanu, Ioana Groza, (2012), Project Romania – Holland - Management of Aquifer Recharge and Energy Storage (MARES) – results and perspectives. INHGA International

Scientific Conference "Hydrological Hazards and Associated Risks Management", Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 213-136)

Rădulescu Daniela, Andreea-Cristina Gălie, Rodica-Paula Mic, Marinela Moldoveanu, (2012), CarpathCC Project (Carpathian in-depth assessment of vulnerability to climate change and ecosystem-based adaptation measures) - Activities and preliminary results. INHGA International Scientific Conference "Hydrological Hazards and Associated Risks Management" / "Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 159-168)

Rădulescu Daniela, Elisabeta Oprişan, Ion Tecuci, Tereza Lazarine, Elisabeta Cserwid, Ramona Dumitrache, Bogdan Ion, (2012), Action and measures for flood risk management in Someş-Tisa, Crişuri, Olt and Siret districts. INHGA International Scientific Conference "Hydrological Hazards and Associated Risks Management", "Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 237-248)

Reinartz (R.), Bloesch (J.), Sandu (C.), Suciu (R.), 2012 - Sturgeon Conservation in the Danube River Basin: How to implement the Sturgeon Action Plan 2005. IN: Limnological Reports, vol. 39 (39th IAD Conference – Living Danube – 21-24 August 2012, Szentendre, Hungary – Proceedings), paginile 101 – 107. Printed by Amulett '98 Kft. Göd/Vácrátot, Hungary. ISBN 978-963-8391-53-7

Salit F., Beltrando G., Zaharia L., 2012, The assessment of river basin and flood management from early twentieth century to the present on the lower Siret River (Romania), Geophysical Research Abstracts, Vol. 14, EGU2012-631, EGU General Assembly 2012, Vienna.

Salit F., L. Zaharia, G. Beltrando, 2012, Les digues et la protection contre les inondations sur le Siret Inférieur (Roumanie), Lucrări ale Sympozionului european „Problemes Actuels de la protection contre les inondations", Paris – Orléans 28-29-30.03.2012, 5 pagini.

Salit F., Zaharia L., Beltrando G., 2012, Impacts of water policy and fight against floods on

Sarbu Nicoleta, Augustina Tronac, 2012, Efficiency strategy for an agricultural farm based on the amount of water available for irrigation, Scientific Papers. Series E. Land Reclamation, Earth Observation&Surveying, Environmental Engineering. Vol. I, paf 79-85, Print ISSN 2285 – 6064, CD-ROM ISSN 2285 – 6072, ISSN-L 2285 – 6064

Slujitoru Cosmin Emanuel, (2012), Flood modelling using a combined 1D2D hydrodynamic model SOBEK-Rural. INHGA International Scientific Conference "Hydrological Hazards and Associated Risks Management", Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 261-272)

Slujitoru Cosmin Emanuel, (2012), Influence of digital elevation model on flood simulation. INHGA International Scientific Conference "Hydrological Hazards and Associated Risks Management", Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 273-282)

Stanica Adrian, Margarita STANCHEVA, Gheorghe Viorel UNGUREANU, Veselin PEYCHEV, Atanas PALAZOV, Hristo STANCHEV, Florin DUTU - Types and impacts of maritime hydraulic structures on the Romanian – Bulgarian Black Sea coast: setting-up a common catalogue for GIS-based coastline classification, , 2012, GeoEco Marina, No 18

Șerbu Maria, Florin Obreja, Gianina Cojoc, Alina Tirnovan, (2012), Floods and droughts-major hydroclimatic risks from the Siret River basin. INHGA International Scientific Conference "Hydrological Hazards and Associated Risks Management", Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 295-308)

Șerpescu I., R.G. Gogu, M.A. Boukhemacha, D. Găitanaru, I. Bica, (2012), 3D geological model as a tool in hydrogeological research Case study: A pilot area in Bucharest City. INHGA International Scientific Conference "Hydrological Hazards and Associated Risks Management" "Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 183-192)

Telteu Camelia – Eliza Camelia, Liliana Zaharia, (2012), Characteristics of floods in the South Dobrogea. INHGA International Scientific Conference "Hydrological Hazards and Associated Risks Management", Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 347-356)

Telteu Camelia – Eliza Camelia, Liliana Zaharia, 2012, Characteristics of floods in the South Dobrogea, în volumul de rezumate al Conferinţei anuale a INHGA "Hydrological hazards and associated risk management", Bucureşti, pag. 98 – 99.

Telteu Camelia – Eliza Camelia, Liliana Zaharia, 2012, Morphometrical and dynamical features of the South Dobrogea lakes, Romania, Procedia Environmental Sciences 14, ELSEVIER, 164 – 176, http://www.sciencedirect.com/science/article/pii/S1878029612004860.

Teodorescu Niculae Iulian, Laurenţiu Luca, Cristian Nichita, (2012), Particular hydrometeorological phenomena registered on some tributaries of the Danube at the entrance in the country on May 24 2012. INHGA International Scientific Conference "Hydrological Hazards and Associated Risks Management", Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 287-294)

Teodorescu Niculae Iulian, Mariana Popescu, Cristian Nichita, (2012), Extraordinary hydrometeorological phenomena recorded in the upper part of Bega river basin in June 10-11 2012. INHGA International Scientific Conference "Hydrological Hazards and Associated Risks Management", Bucharest, 2012, October 8-10 (Proceedings on CD-ROM, ISBN 978-973-0-13559-6, p 327-336)

Toroimac G. Ioana, L. Zaharia, S. Catană, G. Minea, 2012, Relation between river lateral dynamics and floods. Case study: Moara Domneasca village (on lower Teleajen River), vol. Aerul şi Apa – Componente ale mediului, Presa Universitară Clujeană, Cluj-Napoca, pag. 283 - 291. Indexată în baza de date: DOAJ - DIRECTORY OF OPEN ACCES JOURNALS (ISSN: 2067-743X).

Toroimac G. Ioana, Liliana Zaharia, Gabriel Minea, Mihaela Borcan, 2012, Channel typology based on stability criteria. Case study: Ialomiţa and Buzău watersheds (Romania), Procedia Environmental Sciences 14, ELSEVIER, 177 – 187, http://www.sciencedirect.com/science/article/pii/S1878029612004872

Trandafir Romica, Daniel Ciuiu, Radu Drobot, 2012,The Utilization of Copula in Hydrology. Published in: Mathematical Modelling in Civil Engineering. Vol. 7, no.2bis, ISSN 2066-6926, p. 12-19

Udo Job, Cătălin Aldescu, Ramona Dumitrache, Laurenţiu Luca, 2012, Realizarea hartilor de inundabilitate pentru studiu de caz privind raul Timis, mal drept, Revista Hidrotehnica Vol 1

Utkina Kateryna - Results of ranking land-based hotspots, located within Ukrainian coastal zone , , 2012, GeoEco Marina, No 18 (

Voicu Răzvan, Dr. Ecaterina Luca, Proposals for the restoration of longitudinal connectivity of the Jiu River and ensuring fish migration upstream/ downstream of Işalniţa dam. Revista: Lakes, reservoirs and ponds, Romanian Journal of Limnology 6(1-2), Editura Transversal, Târgovişte, 2012. ISSN: 1844-6477.

Zaharia L., Beltrando G., Ioana-Toroimac G., Minea G., Grecu F., 2012, Les sécheresses des dernières décennies dans la plaine roumaine, XXVeme Colloque de l'Association Internationale de Climatologie, „Les climats regionaux: observation et modelisation", Grenoble (Franta), p. 787-792, ISBN 978-2-907696-18-0.

2013

Adam Ionela-Lacrămioara, Ionuț GHEORGHIU, Ion GHEORGHESCU, Daniel VISAN, Jesus PERNAS, Daniel Cătălin SAVU, Myriam LORENZO, Xavier VALLS (2013), Analyze of the

Effects of the Flash Floods in the Lights of the Results Obtained through the Project ” Flood hazard maps and the plan for the prevention, protection and mitigation of the floods effects in Dobrogea – Litoral hydrographic space”. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 75-84)

Adler M.-J., Corbuș C., Mic R.P., Chelcea S., Borcan M. (2013), Climate change and its impact on hydrological extremes. INHGA - Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 261-270)

Aganava (H.), 2013, Rivers are just like blood vessels of the earth, if so, what is the function of deltas? Scientific Annals of the Danube Delta Institute, vol.19

Balan I., Claudiu PRICOP, Ioan BALAN, Dan BURUIANĂ, (2013), Studies Regarding the Safety in Operation of Râpa Albastră Reservoir. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 205-214)

Balan Isabela, Claudiu PRICOP, Ioan BALAN, Dan BURUIANĂ, (2013), Studies Regarding the Safety in Operation of Râpa Albastră Reservoir. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 205-214)

Birsan M, 2013, Application of a distributed physically-based hydrological model on the upper river basin of Somesul Mare (Northern Romania), Romanian Reports in Physics, Volume 65, Number 4, 2013

Birsan M.V., Zaharia L., Chendeş V., Brănescu E. (2013), Seasonal trends in Romanian streamflow. Hydrological Processes, ISSN: 1099-1085, doi: 10.1002/hyp.9961 F.I.: 2,497.

Bondar C., Constantin BORCIA, (2013), Morphological processes on the Romanian Danube riverbed. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 135-146)

Bondar Constantin, Constantin BORCIA, (2013), Morphological processes on the Romanian Danube riverbed. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 135-146)

Borcia C, S. TEODOR, Carmen RADULESCU, Carmen PETREA, R. CIUCA, V. BLENDEA, (2013), General information regarding the completion of hydrological regimes - Case studies of the Danube, the Danube Delta and the Black Sea coastal zone. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 105-116)

Borcia C., Sorin TEODOR, Carmen RADULESCU, Carmen PETREA, Radu CIUCA, Viorel BLENDEA, Alexandru CARSMARIU (2013), (2013), Aspects on the characterization of some wetlands from Danube floodplain. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 183-198)

Carbunaru D. V., S. STEFAN, S. BURCEA, 2013 Weather radar velocity field configurations associated with severe weather situations that occur in South-Eastern Romania

Carbunaru D., S. STEFAN, S. BURCEA, 2013 Weather radar velocity field configurations associated with severe weather situations that occur in South-Eastern Romania

Carsmariu Alexandru, Victor DUMITRESCU, Adrian BARBIERU, Mihai POP, (2013), Possibilities of expansion and diversification of the water-consuming uses with application on the Lower Arges River. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 15-36)

Carsmariu Alexandru, Victor DUMITRESCU, Adrian BARBIERU, Mihai POP, (2013), Possibilities of expansion and diversification of the water-consuming uses with application on the Lower Arges River. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 15-36)

Chelcea S., Adler M.-J., (2013), Legătura dintre seceta meteorologică şi seceta hidrologică pe râul Bârlad, Revista Hidrotehnica, vol. 58, 4-5, pag. 22, ISSN 0439-0962.

Chelcea S., Ionita M., (2013). Extreme value analysis of the Barlad river time series, "Ovidius" University Annals of Constanta, Year XV- Issue 15 - Series CIVIL ENGINEERING journal, ISSN: 1584-5990, pp 273-280

Chelcea S., Mary-Jeanne Adler, 2013: Legătura dintre seceta meteorologică şi seceta hidrologică pe râul Bârlad, revista Hidrotehnica, vol. 58, 4-5, pag. 22, ISSN 0439-0962.

Chelcea, S., Ionita, M., (2013). Extreme value analysis of the Barlad river time series, "Ovidius" University Annals of Constanta, Year XV- Issue 15 - Series CIVIL ENGINEERING journal, ISSN: 1584-5990, pp 273-280

Constandache C., Petrişor VICĂ , Aurel BILANICI, Ion ONUŢU, Caşen PANAITESCU, 2013, Forest hydrology quality and water resources vulnerability in climate changes conditions – European project CC-WARE. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 221-230)

Constantin Tudose N, Şerban Octavian Davidescu, Ioan Clinciu, Adriana Agafia avidescu, Andrei AdorjaniI, Cezar Ungurean, 2013, The allocation of the torrents correction works according to the torrential degree of the river basins. Case Study: Upper Cârcinov Catchment. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 147-156)

Corbuş Ciprian., Nedelcu G., Dinu R., Grigore M., 2013, Determination of the design floods with the same exceedance probability along the river. Application in Lotru river basin equipped with hydraulic structures. INHGA Scientific Conference, Bucharest, September 23-26, 2013, (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 165-172)

Corbuş C., Mic R.P., Mătreaţă M., 2013, Potential climate change impact upon maximum flow in Ialomita river basin. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 237-242)

Corbuş C., Nedelcu G., Andreiu P.-C., Dinu R. - Studiu privind determinarea viiturilor de calcul în bazinul hidrografic Bega Veche amenajat cu acumulări nepermanente, Revista Hidrotehnica 4-5, ISSN 0439-0962

Corbuş C., Nedelcu G., Andreiu P.-C., Dinu R. - Studiu privind determinarea viiturilor de calcul în bazinul hidrografic Bega Veche amenajat cu acumulări nepermanente, Revista Hidrotehnica 4-5, ISSN 0439-0962

Corbuş C., Nedelcu G., Andreiu P.C., Dinu R. (2013), Studiu privind determinarea viiturilor de calcul în bazinul hidrografic Bega Veche amenajat cu acumulări nepermanente. Revista Hidrotehnica, vol. 58, nr. 4-5, Bucureşti, ISSN 0439-0962, p. 14-21

Corbuş Ciprian, Gabriel Nedelcu, Paula-Cristina Andreiu, Rodica Dinu -Studiu privind determinarea viiturilor de calcul în bazinul hidrografic Bega Veche amenajat cu acumulări nepermanente. Hidrotehnica, vol. 58, nr. 4-5, Bucureşti, ISSN 0439-0962, p. 14-21

Costache R., Fontanine Iulia, 2013, Land use changes in the Subcarpathian area between Buzău and Slănic rivers, during 1990-2006 and their consequences on surface runoff, Riscuri si Catastrofe, Vol 13, Nr.2, pp: 171-182 (indexed DOAJ, INDEX COPERNICUS)

Costache R., Fontanine Iulia, 2013, Land use changes in the Subcarpathian area between Buzău and Slănic rivers, during 1990-2006 and their consequences on surface runoff, Riscuri si Catastrofe, Vol 13, Nr.2, pp: 171-182 (indexed DOAJ, INDEX COPERNICUS)

Costache R., Prăvălie R., 2013, The analysis of may 29 2012 flood phenomena in the lower sector of Slănic drainage basin (case of Cernăteşti locality area), Analele Universității Ștefan cel Mare din Suceava, seria Geografie, Vol. 22, Nr. 1, pp: 78-87. (indexed BDI: CrossRef, Doaj, Geoconcept, Uefiscdi). http://georeview.ro/ojs/index.php/revista/article/view/64/pdf_7

Costache R., Prăvălie R., 2013, The analysis of may 29 2012 flood phenomena in the lower sector of Slănic drainage basin (case of Cernăteşti locality area), Analele Universității Ștefan cel Mare din Suceava, seria Geografie, Vol. 22, Nr. 1, pp: 78-87. (indexed BDI: CrossRef, Doaj, Geoconcept, Uefiscdi). http://georeview.ro/ojs/index.php/revista/article/view/64/pdf_7

Costache R., Prăvălie R., 2013, Manifestation potential of surface runoff obtained on the basis of the digital elevation model. Case study: the Subcarpathian sector of Buzău Catchment, Studia Universitatis Babes-Bolyai, Vol. 58, Nr. 2, pp: 39 - 47 (indexed (GEOREF, EBSCO, Index Copernicus, Worldcat.org, British Library, ProQuest etc.)

Costandache Cristinel, Petrişor VICĂ , Aurel BILANICI, Ion ONUŢU, Caşen PANAITESCU, 2013, Forest hydrology quality and water resources vulnerability in climate changes conditions – European project CC-WARE. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 221-230)

Dinu I., Marco BAJO, Giuliano LORENZETTI, Georg UMGIESSER, Luca ZAGGIA, Gabriela MAXIMOV, Adrian STĂNICĂ - Discussion concerning the current circulation along the Romanian Black Sea coast Sorin-Corneliu RĂDAN, Silviu RĂDAN, Irina CATIANIS - The use of the magnetic susceptibility record as a proxy signature for the lithological composition of lake sediments: evidences from short cores in the Meşteru - Fortuna depression (Danube Delta) (2013) GeoEco Marina,No19

Drobot Radu Modelare cuplata hidrologica si hidraulica (MChh) pentru realizarea hartilor de hazard la inundatii. Rev. Hidrotehnica, vol. nr.58 (2013), nr. 4-5, pag. 44-55

Drobot Radu, Marin-Nelu Minciuna - Acviferul transfrontalier din conul aluvionar al raului Somes-Szamos si modelarea matematica a efectului viitoarei captari Vetis. Rev. Hidrotehnica, vol. nr.58 (2013), nr. 3, pag. 41-51.

Dulama D., CRISTIANA RADULESCU, CLAUDIA STIHI, ION V. POPESCU, IONICA IONITA, IOAN ALIN BUCURICA, ELENA DANIELA CHELARESCU, VASILE OVIDIU NITESCU, RALUCA STIRBESCU, 2013, Characterization of Olt river water quality using analytical methods, Romanian Reports in Physics, Volume 65, Number 4, 2013

Dulama I., CRISTIANA Radulescu, CLAUDIA Sihi, ION V. Popescu, 2013, Characterization of Olt river water quality using analytical methods, Romanian Reports in Physics, Volume 65, Number 4, 2013

Dumitru M., Dan DUMITRU, Marinela GALE, (2013), Hydrochemical profile of groundwater in Crisuri river basin. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 173-184)

Farcasiu Cristina (2013), Loire Valley, the necessity of a new integrated management. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 5-14)

Fontanine Iulia, Costache R., (2013), Using GIS techniques for surface runoff potential analysis in the Subcarpathian area between Buzău and Slănic rivers, in Romania. Cinq Continents 3 (7): 201-214 (indexed BDI: Index Copernicus, Doaj). Poate fi accesat la adresa: http://cinqcontinents.geo.unibuc.ro/3/3_7_Fontanine.pdf

Fontanine Iulia, Costache R., 2013, The potential for water diffuse pollution with heavy metals in Arieș river basin, Scientific Annals of "Alexandru Ioan Cuza" University of Iasi - Geography series, Vol. 59, Nr. 2, pp: 59-72 (indexed Index Copernicus, Ulrich’s, ProQuest, Scipio etc) http://www.analegeo.uaic.ro/index.php/SciGeo/article/view/259/pdf_18

Fontanine Iulia, Costache R., 2013, The potential for water diffuse pollution with heavy metals in Arieș river basin, Scientific Annals of "Alexandru Ioan Cuza" University of Iasi - Geography series, Vol. 59, Nr. 2, pp: 59-72 (indexed Index Copernicus, Ulrich’s, ProQuest, Scipio etc) http://www.analegeo.uaic.ro/index.php/SciGeo/article/view/259/pdf_18

Godeanu E., Alina Carstea, 2013 - Environmental assessment national development plan of river basins from Romania, INCD ECOIND-International Symposium-SIMI 2013 "The Environment and the Industry", Bucharest, Romania, 29-30 October 2013, ISSN 2344-3898, pag. 36

Grecu F., Ioana-Toroimac G., Dobre R., Zaharia L., 2013, River channel recent dynamics in relation to floods in the Curvature Carpathians (Romania), Abstracts volume, 8th International Conference on Geomorphology (IAG), Paris, 27 – 31 August, Paris, p.696.

Grecu F., Zaharia L., Ghiţă C., 2013, Hydrogeomorphological Vulnerability in Romanian Plain, Zeitschrift für Geomorphologie, Vol. 57, Suppl. 3, 003-028, Stuttgart (DOI :10.1127/0372-8854/2013/S-00141) (Impact Factor: 0.661) http:// www.ingentaconnect.com /content /schweiz/zfgs/2013/00000057/00000003/art00002

Holstenco (D.), ONĂRĂ (D.F.), SUCIU (R.), HONŢ (Ş.), PARASCHIV (M.), 2013, Distribution and genetic diversity of sturgeons feeding in the marine area of the Danube Delta Biosphere Reserve, Scientific Annals of the Danube Delta Institute, vol.19

Holstenco (D.), ONĂRĂ (D.F.), SUCIU (R.), HONŢ (Ş.), PARASCHIV (M.), 2013, Distribution and genetic diversity of sturgeons feeding in the marine area of the Danube Delta Biosphere Reserve, Scientific Annals of the Danube Delta Institute, vol.19

Ionus Oana, Iulian DINCĂ, (2013), Flood frequency analysis using statistical models. Case study: the Motru catchment area. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 95-104)

Lang (P.), SCHWAB (A.), STAMMEL (B.), EWALD (J.), KIEHL (K.), 2013, Long-term vegetation monitoring for different habitats in floodplains

Luca E., Dr. eng. Răzvan Voicu, Aspects regarding ensuring of fish migration on the Iad River. Case study - Bulz dam , A XIII-a Conferinţa Internaţionala Multidisciplinară SGEM2013 “Modern Management of Mine Producing, Geology and Environmental Protection”, 16 -22 iunie 2013, Albena, Bulgaria. Conference Proceedings: Ecology, economics, education and legislation, vol. I, pp.107-111, 2013. ISSN 1314-2704, DOI: 10.5593/sgem2013

Luca L., Mariana POPESCU, Bogdan MOCANU, Daniela MERAI, Niculae Iulian TEODORESCU, (2013), Analysis of rainfall evolution in Bârzava river basin in the context of climate change. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 243-250)

Macalet R., E. RADU, Cătălina RADU, Ada PANDELE. (2013) – Hydrogeological characterisation of the groundwater bodies from the southern part of Romania. 13th International Multidisciplinary Scientific Geoconference SGEM 2013, Science and Technologies in Geology, Exploration and Mining, 16 – 29 June 2013, Albena , Bulgaria. Conference Proceedings, vol. II, p.211 - 219, ISBN 978-954-91818-8-3, ISSN 1314-2704, DOI: 10.5593/sgem2013

Macalet Rodica, E. RADU, Cătălina RADU, Ada PANDELE. (2013) – Hydrogeological characterisation of the groundwater bodies from the southern part of Romania. 13th International Multidisciplinary Scientific Geoconference SGEM 2013, Science and Technologies in Geology, Exploration and Mining, 16 – 29 June 2013, Albena , Bulgaria. Conference Proceedings, vol. II, p.211 - 219, ISBN 978-954-91818-8-3, ISSN 1314-2704, DOI: 10.5593/sgem2013

Maftei, Carmen & MINEA, G. (2013), Revisiting the Thornthwaite’s method – Case study based on data from the Voineşti Experimental Hydrological Station (Romania), The 13th International Multidisciplinary Scientific GeoConference, Water Resources. Forest, Marine and Ocean Ecosystems, Conference proceedings, pp 277-284.

Matreata, S., Baciu, O., Apostu D., Matreata M., (2013), Evaluation of the Romanian flash flood forecasting system – case study in the Calnau river basin. Die Bodenkultur - Journal for Land Management, Food and Environment. 64. Band/Heft 3-4/ISSN 006-5471, pp 7-72.

Mehta Dharmendra, Naveen K. MEHTA - Interlinking of Rivers in India: Issues & Challenges , (2013) GeoEco Marina,No19

Mic R. P., Corbuș Ciprian, Busuioc Aristita (2013), Climate Change Impact upon Water Resources in the Buzău and Ialomița River Basins. Revue Roumaine de Géographie | Romanian Journal of Geography, volume 57, (2), p 93-104, 2013

Mic R. P., Corbus C. (2013a), Assessment of the potential impact of climatic change and variability onthe flow of Somes river basin, Romania. EGU General Assembly 2013, Geophysical Research Abstracts, Vol. 15, EGU2013-4144, 2013

Mic R. P., Corbus C. (2013b), Climatic change impact on the mean monthly and annual discharge of Somes River and theirs tributaries. 13th SGEM GeoConference on Water Resources. Forest, Marine And Ocean Ecosystems, SGEM2013 Conference Proceedings, ISBN 978-619-7105-02-5/ISSN 1314-2704, June 16-22, 2013; DOI:10.5593/ SGEM2013/ BC3/ S12.008

Mic Rodica Paula and Ciprian Corbus (2013), Assessment of the potential impact of climatic change and variability on the flow of Somes river basin, Romania, USGS Proceedings

Mic Rodica Paula, Ciprian Corbus -Assessment of the potential impact of climatic change and variability onthe flow of Somes river basin, Romania. EGU General Assembly 2013, Geophysical Research Abstracts, Vol. 15, EGU2013-4144, 2013

Mic Rodica Paula, Ciprian Corbus -Climatic change impact on the mean monthly and annual discharge of Somes River and theirs tributaries. 13th SGEM GeoConference on Water Resources. Forest, Marine And Ocean Ecosystems, SGEM2013 Conference Proceedings, ISBN 978-619-7105-02-5/ISSN 1314-2704, June 16-22, 2013; DOI:10.5593/ SGEM2013/ BC3/ S12.008

Mic Rodica Paula, Corbuș Ciprian, Busuioc Aristita (2013), Climate Change Impact upon Water Resources in the Buzău and Ialomița River Basins. Revue Roumaine de Géographie | Romanian Journal of Geography, volume 57, (2), p 93-104, 2013

Minea, G. (2013), Assessment of the flash flood potential of Bâsca River Catchment (Romania) based on physiographic factors, Central European Journal of Geosciences, Volume 5, Issue 3, pp 344-353.

Minea Gabriel şi CHENDEŞ Viorel (2013), Some aspects regarding the maximum flow the cold season in the upper part of the Buzău River Catchment, Aerul şi apa componente ale mediului, Vol. 4, Ed. Gavril PANDI şi Florin MOLDOVAN, Editura Presa Universitară Clujeană, Cluj-Napoca, ISSN: 2067–743X, pp 63-70

Minea, G. şi CHENDEŞ, V. (2013), Some aspects regarding the maximum flow the cold season in the upper part of the Buzău River Catchment, Aerul şi apa componente ale mediului, Vol. 4, Ed. Gavril PANDI şi Florin MOLDOVAN, Editura Presa Universitară Clujeană, Cluj-Napoca, ISSN: 2067–743X, pp 63-70.

Mocanu Mariana a, Marian Muste, Vasile Lungu, Radu Drobot - Composite application for water resources management. Published in: Advances in Intelligent Systems and Computing. Vol. 187, 2013, Publisher Springer- Verlag Berlin, ISSN 2194-5357 (Print) 2194-5365 (Online), ISBN 978-3-642-32547-2, pp. 295-306, Book DOI: 10.1007/978-3-642-32548-9. ISI paper.

Mocanu Mariana, Lucia Vacariu, Radu Drobot, Marian Muste - Information-centric Systems for Supporting Decision-Making in Watershed Resource Development. Paper 103, pages 611-616, Proceedings of the 19th International Conference on Control Systems and Computer Science (CSCS 2013). Edited by Dumitrache, I; Florea, AM; Pop, F. ISI paper.

Moldoveanu M., Tanase I., Lazarine T., "Dimensionarea zonelor de protectie sanitara pentru captarile de apa din rauri. Studiu de caz." Revista Hidrotehnica Vol. 59, nr. 4-5, ISSN 0439-0962, 2014, Bucuresti

Moldoveanu M., Tanase I., Lazarine T., "Dimensionarea zonelor de protectie sanitara pentru captarile de apa din rauri. Studiu de caz." Revista Hidrotehnica Vol. 59, nr. 4-5, ISSN 0439-0962, 2014, Bucuresti

Nedelea, L. Zaharia, L. Comanescu, 2013, Mapping flood vulnerability. Case study: Tecuci Town (Romania), 26 International Cartographic Conference, August 25 – 30, 2013, Dresden, Germany, p. 487 (abstract) &8 p. large abstract.

Nita M., Ioan CLINCIU (2013), Monitoring of dams for torrent control check using point clouds from images. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 157-164)

Oncia S., Loredana COPĂCEAN, Mihai HERBEI, 2013, Hydrological hazards in the Bega river basin INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 117-124)

Panaitescu, Casen, Onutu, I., 2013, Monitoring the quality of the sludge resulted from domestic wastewater treatment plants and the identification of risk factors, Environmental engineering and management journal, Vol. 12, pp 351-358;

Papadopoulu Vasiliki, Mary-Jeanne ADLER, (2013), Flood CBA Project for ranking flood protection measures. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 37-42)

Papadopoulu Vasiliki, Mary-Jeanne ADLER, (2013), Flood CBA Project for ranking flood protection measures. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 37-42)

Pasoi Ion, Mary-Jeanne ADLER (2013), Considerations regarding the methods of economic efficiency in structuring national hydrological network. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 59-66)

Perju E. R., Zaharia L., Balin D., Lane S., 2013, Hydrological response to climate changes in Bucegi Mountains, Volume of abstracts, Annual Scientific Conference „Water Resources Management under Climate and Anthropogenic Changes”, 23 – 26 Septembrie, Bucureşti, pag. 98 -99.

Perju Elena-Ruth , Daniela Balin , Stuart Lane, Liliana Zaharia, 2013, Climate change impacts on water balance in the Romanian Carpathians:more droughts but fewer floods?, Geophysical Research Abstracts ,Vol. 15, EGU2013-8284, European Geosciences Union-General Assembly, Vienna.

Perju Elena-Ruth , Daniela Balin , Stuart Lane, Liliana Zaharia, 2013, Changing flood magnitude and frequency in snow-melt dominated catchments: the case of the Bucegi Mountains, in the Romanian Carpathian region, Geophysical Research Abstracts, Vol. 15, EGU2013-10110, European Geosciences Union-General Assembly, Vienna.

Perju Elena-Ruth, Daniela Balin , Stuart Lane, Liliana Zaharia, 2013, Climate change impacts on water balance in the Romanian Carpathians:more droughts but fewer floods?, Geophysical Research Abstracts ,Vol. 15, EGU2013-8284, European Geosciences Union-General Assembly, Vienna.

Popescu M., Laurenţiu LUCA, Bogdan MOCANU, Daniela MERAI, Niculae Iulian TEODORESCU, (2013), Trend analysis of rainfall time series in upper part of Timiş river basin in the context of climate change. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 251-260)

Prăvălie R., Costache R., (2013), The vulnerability of the territorial-administrativ units to the hydrological phenomena of risk (flash flood). Case study: The subcarpathian sector of Buzău catchment, Analele Universităţii din Oradea – Seria Geografie, Year XXIII, Nr. 1/2013 (June), pp: 91-98, (indexed B+) http://geografie-uoradea.ro/Reviste/Anale/Art/2013-1/AUOG_616_Pravalie.pdf

Pricop Claudiu, Irina TUTUNARU, Isabela BALAN, Tudor BLIDARU, Ionuţ JORA (2013), Comparative study regarding registered floods on the upper stream of the Bârlad River using numerical model methods. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 85-94)

Radu E., Rodica MACALET, Cătălina RADU, Bogdan ION, Ada PANDELE. (2013) – The Danube Water Integrated Management (WATER) Project – Lithological and hydrogeological considerations concerning the Quaternary deposits on the left side of the Danube, between Pristol and Jiu river. 13th International Multidisciplinary Scientific Geoconference SGEM 2013, Science and Technologies in Geology, Exploration and Mining, 16 – 29 June 2013, Albena , Bulgaria. Conference Proceedings, vol. II, p.491 – 498, ISBN 978-954-91818-8-3, ISSN 1314-2704, DOI: 10.5593/sgem2013

Radu E., Rodica MACALET, Cătălina RADU, Bogdan ION, Ada PANDELE. (2013) – The Danube Water Integrated Management (WATER) Project – Lithological and hydrogeological considerations concerning the Quaternary deposits on the left side of the Danube, between Pristol and Jiu river. 13th International Multidisciplinary Scientific Geoconference SGEM 2013, Science and Technologies in Geology, Exploration and Mining, 16 – 29 June 2013, Albena , Bulgaria. Conference Proceedings, vol. II, p.491 – 498, ISBN 978-954-91818-8-3, ISSN 1314-2704, DOI: 10.5593/sgem2013

Radu, E., Macalet, R., Radu, C., Ion, B., Pandele A., 2013, – Proiectul Water Management integrat al fluviului Dunarea – Consideratii litologige si hidrogeologice privind depozitele cuaternare de pe partea stanga a Dunarii, intre Pristol si raul Jiu, 13th International Multidisciplinary Scientific Geoconference SGEM 2013, Science and Technologies in Geology, Exploration and Mining, Albena , Bulgaria, Conference Proceedings, vol. II, p.491 – 498, ISBN 978-954-91818-8-3, ISSN 1314-2704, DOI: 10.5593/sgem2013, 2013.

Salajan L., (2013), (2013), The analysis of flash floods occurred in the upper catchment of Jijia. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 125-134)

Salit F., Arnaud-Fassetta g., Zaharia L., Madelin M., Beltrando G., 2013, Morphological changes of the Lower Siret River from 1891 to 2010: the decisive impact of engineering works and water management strategy, Abstracts volume, 8th International Conference on Geomorphology (IAG), Paris, 27 – 31 August, Paris, p.794.

Salit F., Zaharia L., Beltrando G., 2013, Les digues et la protection contre les inondations sur le Siret Inferieur, Volume of the Européen Symposium „Anti-flood defences – Today's problems", 28 – 29.03.2012, Paris-Orléans, pag. 118 – 124.

Salit F., Zaharia L., Beltrando G., 2013, Les temporalités de la gestion de l'espace fluvial en Roumanie – du rôle de l'événement majeur dans les stratégies d'aménagement du Siret inférieur, Volume des résumés, Colloque « Regards croisés sur l'aménagement des cours d'eau », 21 – 22 novembre, Mulhouse (France), pag. 17.

Salit Florence, Beltrando Gérard, Zaharia Liliana, 2013, From the impact of July 2005 flood to river management: study case of the Lower Siret River (Romania) , in European Continental Hydrosystems under Changing Water Policy, G. Arnaud-Fassetta, E. Masson & E. Reynard (Editors), Verlag Friedrich Pfeil, München, 273 – 280, ISBN 978-3-89937-157-4.

Salit Florence, L. Zaharia, G. Beltrando, 2013, Assessment of the warning system against floods on a rural area:the case of the lower Siret River (Romania), Nat. Hazards Earth Syst. Sci., 13, 409–416 (Impact Factor: 1.751), www.nat-hazards-earth-syst-sci.net/ 13/409/2013/doi:10.5194/nhess-13-409-2013

Savu H. Exhumation of the South Carpathians (Romania) and their block structure. Rom. J. of Earth Sciences, 86/1: 51-58, București.

Savu H. Exhumation of the South Carpathians (Romania) and their block structure. Rom. J. of Earth Sciences, 86/1: 51-58, București.

Savu H. The North Dobrogea granite province: petrology and origin of its rocks. Rev. Roum. de Géologie, 56/1- (2012): 3-15, București.

Schwarz (U.), 2013, Restoration potential for Danube River Basin, lower Danube and Mura Drava Danube Biosphere Reserve, Scientific Annals of the Danube Delta Institute, vol.19

Simionov V., O.G. DULIU, 2013, Potential radioactive liquid discharge program in Danube Black Sea channel by Cernavoda Nuclear Power Plant in 2009, Romanian Reports in Physics, Volume 65, Number 4, 2013

Slave C., Carmen MAN, Anca ROTMAN, Claudiu DIMA (2013), Use of remote sensing in monitoring water quality INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 215-220)

STAN Florentina, Alin Pohoata, Gianina Neculau, Petre Bretcan (2013), Empirical modeling of summer lake surface temperatures in Caldarusani lake, Lakes, reservoirs and Ponds, Volum 7, p. 63-72,ISSN: 1844-6477

Stef I., (2013), Hydrological Balance of the Ighiu Tarn. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 199-204)

Tabarcea Cristina - New ciliate in the Romanian Black Sea waters - Laboea strobila (protozoa, ciliophora, oligotrichia) (2013) GeoEco Marina,No19

Tanase I., Galie A. C., Radulescu D., 2013, "Aplicarea unor metode de determinare a debitelor de protectie a ecosistemelor acvatice" revista Hidrotehnica nr 4-5, vol. 58,

Telteu Camelia-Eliza, STAN Florentina-Iuliana şi OPREAN O. (2013), Runoff characteristics in Dobrogea, Conferinţa "Aerul şi apa, component ale mediului", 22-23 martie 2013, Cluj-Napoca, pp. 301-308

Telteu Camelia-Eliza, STAN Florentina-Iuliana şi OPREAN O. (2013), Runoff characteristics in Dobrogea, Conferinţa "Aerul şi apa, component ale mediului", 22-23 martie 2013, Cluj-Napoca, pp. 301-308

Telteu, STAN Florentina-Iuliana şi OPREAN O. (2013), Runoff characteristics in Dobrogea, Conferinţa "Aerul şi apa, component ale mediului", 22-23 martie 2013, Cluj-Napoca, pp. 301-308

Toroimac Gabriela Ioana, G. Minea, Liliana Zaharia, R. Zarea, Mihaela Borcan, 2013, Hydrogeomorphological River typology in the Ialomiţa and Buzău catchments (Romania), in European Continental Hydrosystems under Changing Water Policy, G. Arnaud-Fassetta, E. Masson & E. Reynard (Editors), Verlag Friedrich Pfeil, München, 261 – 272, ISBN 978-3-89937-157-4.

Toroimac Gabriela IOANA, Liliana ZAHARIA, Florina GRECU, (2013), Braided channel's adjustments in relation to hydroclimatic variability. Case study: Slănic River (Buzău). INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 67-74)

Toroimac Gabriela, Zaharia Liliana, Grecu Florina, 2013, Braided channel's adjustments in relation tu hydroclimatic variability. Case study: Slănic River (Buzău river basin), Volume of abstracts, Annual Scientific Conference „Water Resources Management under Climate and Anthropogenic Changes", 23 – 26 Septembrie, Bucureşti, pag. 30 – 31.

Toroimac I., Gabriela, MINEA, G., ZAHARIA Liliana, ZAREA, R. and BORCAN, Mihaela (2013), Hydrogeomorphological river typology in the Ialomita and Buzau catchments (Romania) in European Continental Hydrosystems under Changing Water Policy, Eds. Gilles ARNAUD-FASSETTA, Eric MASSON and Emmanuel REYNARD, ISBN: 978-3-89937-157-4, pp. 261-272.

Torok (L.), 2013, Hazard risk and alert level in assessment of a rehabilitated urban lake, Scientific Annals of the Danube Delta Institute, vol.19

Torok (L.), TEODOROF (L.), 2013, Data on abiotic (nutrients) and biotic (phytoplankton) quality elements in Fortuna ecologically reconstructed area (Danube Delta Biosphere Reserve - Romania), Scientific Annals of the Danube Delta Institute, vol.19

Trandafir Romică, Daniel Ciuiu, Radu Drobot - Estimation of the Statistical Distribution Used in Hydrology Using Kernel Functions. Mathematical Modelling in Civil Engineering, no. 3/2013, p. 5-11.

Trifu M. C, Bioengineering Solutions for Restoring Lotic Ecosystems, livebetter eMAGAZINE, April 2013, WV, US. (editie electronica).

Trifu M. C, M. B. Ion, V. Daradici, 2013 - Different methods for farmer’s implication in the nitrate management at river basin scale, 13th SGEM GeoConference on Water Resources. Forest, Marine And Ocean Ecosystems, www.sgem.org, SGEM2013 Conference Proceedings, ISBN 978-619-7105-02-5 / ISSN 1314-2704, 2013, 101 - 108 pp (ISI Web of Knowledge).

Trifu M. C., Luca E., Dumitrache R., Moldoveanu C., 2013 - Proiectul Water - Management integrat al fluviului Dunarea - Water Quality Evolution along the Romanian - Bulgarian Border Area, 1st International Conference Danube - Black Sea 3E - Energy, Environment & Efficiency 2013, 18-21 September 2013, Galati, Romania, ISBN 978-606-8348-82-7, pag. 60.

Tudose Nicu Constantin, Şerban Octavian DAVIDESCU, Ioan CLINCIU, Adriana Agafia DAVIDESCU,
Andrei ADORJANI, Cezar UNGUREAN, (2013), The allocation of the torrents correction works according to the torrential degree of the river basins. Case Study: Upper Cârcinov Catchment. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 147-156)

Voicu R., Dr. Ecaterina LUCA, biol. Liliana VOICU System for facilitate fish migration upstream/downstream of the Bulz Dam, Revista: Lakes, reservoirs and ponds, Romanian Journal of Limnology Volume 7(1)/2013, Editura Transversal, Târgovişte, 2013. ISSN: 1844-6477. (sub tipar, rezumatul postat pe situl www.limnology.ro)

Voicu R., Dr. Ecaterina Luca, Ensuring of fish migration upstream the Isalnita dam, A XIII-a Conferinţa Internaţionala Multidisciplinară SGEM2013 “Modern Management of Mine Producing, Geology and Environmental Protection”, 16 -22 iunie 2013, Albena, Bulgaria. Conference Proceedings: Ecology, economics, education and legislation, vol. I, pp.369-376, 2013. ISSN 1314-2704, DOI: 10.5593/sgem2013

Voicu R., Ecaterina LUCA, (2013), Solution to facilitate fish migration upstream of the weir located on the Crişul Repede River, near the Dacia Bridge. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 231-236)

Voicu R.,, Fish Migration Eco-Solution IV, livebetter eMAGAZINE, January 2013, WV, US. (editie electronica).

Voicu Răzvan, Bioengineering Solutions for Restoring Lotic Ecosystems, livebetter eMAGAZINE, April 2013, WV, US. (editie electronica).

Voicu Răzvan, Dr. Ecaterina LUCA, biol. Liliana VOICU System for facilitate fish migration upstream/downstream of the Bulz Dam, Revista: Lakes, reservoirs and ponds, Romanian Journal of Limnology Volume 7(1)/2013, Editura Transversal, Târgovişte, 2013. ISSN: 1844-6477. (sub tipar, rezumatul postat pe situl www.limnology.ro)

Voicu Răzvan, Dr. Ecaterina Luca, Ensuring of fish migration upstream the Isalnita dam, A XIII-a Conferinţa Internaţionala Multidisciplinară SGEM2013 “Modern Management of Mine Producing, Geology and Environmental Protection”, 16 -22 iunie 2013, Albena, Bulgaria. Conference Proceedings: Ecology, economics, education and legislation, vol. I, pp.369-376, 2013. ISSN 1314-2704, DOI: 10.5593/sgem2013

Voicu Răzvan, Ecaterina LUCA, (2013), Solution to facilitate fish migration upstream of the weir located on the Crişul Repede River, near the Dacia Bridge. INHGA Scientific Conference, Bucharest, September 23-26, 2013. (Proceedings on CD_ROM, ISBN 978-973-0-15357-6, p 231-236)

Zaharia L., 2013, L-moments and their use in maximum discharges' analysis in Curvature carpathians region, vol. Aerul şi Apa – Componente ale mediului, Presa Universitară Clujeană, Cluj-Napoca, pag. 119-126. Indexată în baza de date: DOAJ - DIRECTORY OF OPEN ACCES JOURNALS (ISSN: 2067-743X).

Zaharia L., Ioana-Toroimac G., Mailat E., Soare M., 2013, Aménagement des cours d'eau dans la région de Bucarest – approche géohistorique et hydrologique, Volume des résumés, Colloque « Regards croisés sur l'aménagement des cours d'eau », 21 – 22 novembre, Mulhouse (France), pag. 24.

Zaharia Liliana, Gabriela Ioana-Toroimac, 2013, Romanian Danube River management: Impacts and perspectives, in European Continental Hydrosystems under Changing Water Policy, G. Arnaud-Fassetta, E. Masson & E. Reynard (Editors), Verlag Friedrich Pfeil, München, 159 – 170, ISBN 978-3-89937-157-4.

Zaharia Liliana, Gabriela Ioana-Toroimac, 2013, Romanian Danube River management: Impacts and perspectives, in European Continental Hydrosystems under Changing Water Policy, G. Arnaud-Fassetta, E. Masson & E. Reynard (Editors), Verlag Friedrich Pfeil, München, 159 – 170, ISBN 978-3-89937-157-4.

Zaharia Liliana, Gabriela IOANA-TOROIMAC, Mariana SOARE, Emanuel MAILAT, OCTAVIAN COCOŞ, 2014, La gestion des rivières dans la région de Bucarest, Vème Colloque Roumain – Algérien – Français Directions contemporaines dans l'étude du territoire. La gestion du territoire, des aléas et de la ville, Bucarest, 27 – 29 mai 2014, pag. 42.

2014

Adler M-J (2014) Geodata Base for Danube Flood Hazard and Risk Maps Atlas, Proceedings Danube Conference 2014, XXVI Conference of the Danubian Countries on Hydrological Forecasting and Hydrological Bases of Water Management, 22-24 September 2014, Deggendorf, Germany, pag. 183-187

Adler M-J, Chelcea S, Barbuc M, Dragusin D, (2014) Impactul schimbarilor climatice asupra regimului hidrologic in Romania – Identificarea perioadelor secetoase, Dialogul de consultare nationala organizat in cadrul proiectului „Integrated Drought Management Programme in Central and Eastern Europe, parte a invitatiei GWP si OMM, 27 februarie, ANM

Adler M-J, Chelcea S, Barbuc M, Dragusin D, (2014) Impactul schimbarilor climatice asupra regimului hidrologic in Romania – Identificarea perioadelor secetoase, Dialogul de consultare nationala organizat in cadrul proiectului „Integrated Drought Management Programme in Central and Eastern Europe, parte a invitatiei GWP si OMM, 27 februarie, ANM

Adler M-J, Macalet R., Borcan M., Nastasa S (2014), Fundamentarea sprijinului acordat in vederea compensarii costurilor suplimentare si a pierderilor de venituri generate de dezavantajele rezulatte din punerea in aplicare a Directivei 2000/60/CE, INHGA Scientific Conference, "Adaptation to climate change, from source to river basin", Bucharest, November 10-11, 2014 (Proceedings on CD-ROM, ISBN 978-973-0-18825-7, p 73-83

Adler M-J, R. Macalet, M. Borcan, S Nastasa (2014), Fundamentarea sprijinului acordat in vederea compensarii costurilor suplimentare si a pierderilor de venituri generate de dezavantajele rezulatte din punerea in aplicare a Directivei 2000/60/CE, „Adaptation to climate change, from source to river basin" Conference, 10-11 November, 2014, Bucharest, ISBN 978-973-O-17800-6

Adler M-J, S. Chelcea (2014) Climate Change and its Impact in Water management in Romania, Proceedings Danube Conference 2014, XXVI Conference of the Danubian Countries on

Hydrological Forecasting and Hydrological Bases of Water Management, 22-24 September 2014, Deggendorf, Germany, pag. 83-89,

Adler M-J., 2014, Prezentare generala pentru Proiectul Danube WATER/ Danube WATER – a general presentation, „Adaptation to climate change, from source to river basin” Conference, 10-11 November, 2014, Bucharest, ISBN 978-973-O-17800-6

Adler M-J., 2014, Prezentare generala pentru Proiectul Danube WATER/ Danube WATER – a general presentation, „Adaptation to climate change, from source to river basin” Conference, 10-11 November, 2014, Bucharest, ISBN 978-973-O-17800-6

Adler M-J., O. Islam, (2014), “Strategia de comunicare pentru proiectul Danube Floodrisk – o poveste despre protectia împotriva inundatiilor/Communication Strategy for the Danube Floodrisk Project – A Flood Protection Story”, INHGA Scientific Conference, “Adaptation to climate change, from source to river basin”, Bucharest, November 10-11, 2014 (Proceedings on CD-ROM, ISBN 978-973-0-18825-7, p143-151

Adler, M.-J., Pașoi, I. (2014), Situația rețelei hidrometrice. Propuneri de eficientizare, Revista Viitura, 8, p. 4-6.

Adler, M.-J., Tereza GEORGESCU, Lavinia FRIMESCU, Steluta NĂSTASĂ, Alexandru MOLDOVEANU, Ion PASOI „Flood-CBA – “Platforma de informare pentru evaluarea costurilor si beneficiilor masurilor de prevenire a inundatiilor”, INHGA - Scientific Conference, “Adaptation to climate change, from source to river basin”, Bucharest, November 10-11, 2014 (Proceedings on CD-ROM, ISBN 978-973-0-18825-7, *p137-142*

Bălteanu Dan, Marta Jurchescu, Virgil Surdeanu, Ion Ionita, Cristian Goran, Petru Urdea, Maria Rădoane, Nicolae Rădoane, and Mihaela Sima, 2012, Chapter 10 Recent Landform Evolution in the Romanian Carpathians and Pericarpathian Regions, D. Lóczy et al. (eds.), Recent Landform Evolution: The Carpatho–Balkan–Dinaric Region, Springer Geography, DOI 10.1007/978-94-007-2448-8_10,

Bierezensoj-BAZILLE (U.), GRYGORUK (M.), 2012, Scale matters: Efficiency assessment of EU environmental directives implementation in a local-scale management of protected wetlands in Poland, Scientific Annals of the Danube Delta Institute, vol.19

Birsan M.V., Zaharia L., Chendeş V., Brănescu E., 2014, Seasonal trends in Romanian streamflow. Hydrological Processes 28 : 4496-4505. DOIi: 10.1002/hyp.9961 (Impact Factor: 2.497) http://onlinelibrary.wiley.com/doi/10.1002/hyp.9961/abstract

Bondar C., Borcia C., (2014) Procesul de transport aluvionar pe albiile Dunării (The alluvial transport on the Danube river beds). INHGA Scientific Conference, “Adaptation to climate change, from source to river basin”, Bucharest, November 10-11, 2014 (Proceedings on CD-ROM, ISBN 978-973-0-18825-7, p 25-35)

Borcan, Mihaela, Neculau, Gianina, Retegan, Mihai, (2014): The influence determined by the changing of mark climatic parameters upon the hydrological regime in southern Romania, Proceedings (BDI) „14th GeoConference on Water Resources. Forest, Marine and Ocean Ecosystems”, 17-26 iunie 2014, Albena, Bulgaria, în Proc., I, p. 759 – 766. DOI: 10.5593/SGEM2014/B31/S12.097

Borcia C., Sorin TEODOR, Carmen RADULESCU, Radu CIUCA, Viorel BLENDEA, Carmen PETREA, Alexandru CARSMARIU, (2014), Aspecte privind impactul fenomenelor şi proceselor hidrologice asupra navigaţiei şi folosinţelor apei în cazul sectorului românesc al Dunării. INHGA Scientific Conference, “Adaptation to climate change, from source to river basin”, Bucharest, November 10-11, 2014 (Proceedings on CD-ROM, ISBN 978-973-0-18825-7, p 57-72)

Borcia C., TEODOR S., RADULESCU C., CIUCA R., BLENDEA V., PETREA C., (2014), Aspecte privind variabilitatea unor parametri hidrologici ca urmare a impactului antropic şi al schimbărilor climatice în cazul Dunării inferioare. INHGA Scientific Conference “Adaptation to climate change, from source to river basin", Bucharest, November 10-11, 2014 (Proceedings on CD-ROM, ISBN 978-973-0-18825-7, p 227-240)

Bulankova (E.), BERACKO (P.), DERKA (T.), 2014, Occurrence of protected species (Gomphus flavipes, Odonata, Palingenia longicauda, Ephemeroptera) in the Danube River and its deltas (Romania, Slovakia, Scientific Annals of the Danube Delta Institute, vol.19 ,

Chelcea S., Adler M.-J., (2014), Guidebook for the management of low flows in the flood plain of the Danube River Case study in Romania - Estimation of drought indices and low flow for the Danube River. INHGA Scientific Conference "Adaptation to climate change, from source to river basin", Bucharest, November 10-11, 2014 (Proceedings on CD-ROM, ISBN 978-973-0-18825-7, p 167-181)

Chelcea S., Adler, M.-J. (2014), Indici pentru estimarea frecvenței secetei hidrologice - Studiu în bazinul hidrografic al râului Bârlad, Revista Viitura, 9, p. 7-12.

Chendes Viorel, Daniela RĂDULESCU, Sorin RÎNDAŞU, Diana ACHIM, Bogdan ION, Tereza GEORGESCU, Alexandru PREDA „Date geospațiale și metode utilizate pentru obținerea hărților de risc raportate în cadrul Directivei Inundații", Conferinţa Ştiinţifică INHGA „Adaptaton to climate change, from source to river basin", 10-11 noiembrie, Bucureşti 2014

Chitu Z., Bogaard T., Adler MJ (2014): Regional hydrological characteristics to assess landslides triggering rainfall thresholds in Ialomita Subcarpathians- Prezentare poster EGU2014-15564

Chitu Z., Bogaard T., Adler MJ.,Steele-Dunne S., Hrachowitz M., Busuioc A., Sandric I., and Istrate A., 2014, Exploring the Role of Soil Moisture Conditions for Rainfall Triggered Landslides on Catchment Scale: the case of the Ialomita Sub Carpathians, Romania - Prezentare poster EGU2014-9693

Chitu Z., Istrate A., Adler MJ., Sandric I., Olariu B., Mihai B., 2014, Comparative study of the methods for assessing landslide susceptibility in Ialomiţa Subcarpathians, Romania in Engineering Geology for Society and Territory, IAEG XII Congress Volumes, 2014, Springer Verlag Edition, ISBN 978-3-319-10303-7

Constandache C, Sanda Nistor, 2014, Preventing and control of soil erosion and agricultural land by antierosional shelter-belts, Scientific Papers. Series E. Land Reclamation, Earth Observation & Surveying, Environmental Engineering. Vol. III, pag. 29-36, Print ISSN 2285-6064, CD-ROM ISSN 2285-6072, ISSN-L 2285-6064

Gh., Bălăeţ R., Neamţu S., Adler M.-J., 2014, Legal harmonization in the water sector for strenghtening transboundary cooperation between Romania and Bulgaria – Contributions from Danube WATER Project. INHGA Scientific Conference "Adaptation to climate change, from source to river basin", Bucharest, November 10-11, 2014 (Proceedings on CD-ROM, ISBN 978-973-0-18825-7, p 191-202)

Corbuș C., Retegan M., Barbuc M., 2014, Estimarea modificării regimului hidrologic al râului Casimcea (Dobrogea) în condițiile scenariilor climatice ipotetice, Viitura, 9, p. 13-18.

Corbuş C., MIC R P., Mătreaţă M., 2014, Continuous flow simulation in the Bârlad river basin, Romania. EGU General Assembly 2014, Geophysical Research Abstracts Vol. 16, EGU2014-13956

Corbuş C., Nedelcu G., Andreiu P.-C., Dinu R. - Studiu privind determinarea viiturilor de calcul în bazinul hidrografic Bega Veche amenajat cu acumulări nepermanente, Revista Hidrotehnica 4-5, ISSN 0439-0962

Corbuş C., Rodica MIC, Marius Mătreaţă, 2014, Continuous flow simulation in the Bârlad river basin, Romania, EGU General Assembly 2014, Geophysical Research Abstracts Vol. 16, EGU2014-13956

Corbuş, C., Mic, R.P., Mătreaţă, M., 2014, Calibrarea parametrilor modelului hidrologic CONSUL prin simularea scurgerii în bazinul hidrografic Bârlad, INHGA Scientific Conference

"Adaptation to climate change, from source to river basin", Bucharest, November 10-11, 2014 (Proceedings on CD-ROM, ISBN 978-973-0-18825-7, p 37-47)

Corbuş C., MIC R P., Mătreaţă M. 2014, *Continuous flow simulation in the Bârlad river basin, Romania*. EGU General Assembly 2014, Geophysical Research Abstracts Vol. 16, EGU2014-13956

Costache R., 2014, Assessing monthly average runoff depth in Sărățel river basin, Romania, Scientific Annals of "Alexandru Ioan Cuza" University of Iasi - Geography series, Vol. 60, Nr.1, pp: 97-110 (indexed Index Copernicus, Ulrich's, ProQuest, Scipio etc) http://www.analegeo.uaic.ro/index.php/SciGeo/article/view/318/pdf_32

Costache R., 2014, Estimating multiannual average runoff depth in the middle and upper sectors of Buzău River Basin, Geographia Technica, Vol. 9, Nr. 2, pp: 21-29 (indexed (SCOPUS, GEOBASE, EBSCO, SJR) http://technicalgeography.org/pdf/2_2014/03_costache.pdf

Costache R., 2014, Using GIS techniques for assessing Lag time and Concentration time in small river basins. Case study:Pecineaga river basin, Romania. Geographia Technica, Vol. 9, Nr.1, pp: 31-38 (indexed (SCOPUS, GEOBASE, EBSCO, SJR),

Costache R., Fontanine I., Corodescu E., 2014, Assessment of surface runoff depth changes in Sărățel River Basin, Romania, using GIS techniques, Central European Journal of Geosciences, 6(3): 363-372. Springer (Factor de Impact : 0.432)

Costache R., Popescu C., Ștefan A., 2014, GIS techniques for assessing the link between Human accesibility and territorial distributioon of the population in Hunedoara County, Studia UBB Geographia, Vol. 59, Nr. 1, pp: 127 – 136 (indexed (GEOREF, EBSCO, Index Copernicus, Worldcat.org, British Library, ProQuest etc.)

Costache R., Zaharia L., 2014, Assessment of buildings vulnerability to flash-flood in Pănătău River Catchment, Abstracts volume of the Annual Scientific Conference of National Institute of Hydrology and Water Management and of National Administration „Apele Române", 10 – 11 November, Bucharest, p. 53, ISBN 978-973-0-17800-6.

Drobot R., Aurelian Draghia, „DSS for operation of the lateral reservoirs during flood periods", ISI paper; BDI: Scopus, IEEE Xplore, DOI: 10.1109/AQTR.2014.6857922, 2014 IEEE International Conference on Automation, Quality and Testing, Robotics. AQTR 2014, - THETA 19th edition, ISBN: 978-1-4799-3731-8. INSPEC Accession Number: 1445239. Publisher: IEEE

Drobot R., Cristian Dinu, Aurelian Draghia, Mary-Jeanne Adler, Ciprian Corbus, Marius Matreata – Simplified approach for floods estimation and propagation. ISI paper; BDI : Scopus, IEEE Xplore. DOI : 10.1109/AQTR.2014.6857921, 2014 IEEE International Conference on Automation, Quality and Testing, Robotics. AQTR 2014, - THETA 19th edition - ISBN: 978-1-4799-3731-8. INSPEC Accession Number: 14452375. Publisher: IEEE

Gălie Andreea, Marinela Moldoveanu, Daniela Rădulescu, River hydro-morphological assessment - Romanian approach, XXVI Conference of the Danubian Countries on Hydrological Forecasting and Hydrological bases of Water Management, 22-24 Septembrie 2014, Deggendorf, Germany

Godeanu Elena, Ionela FLORESCU, Ramona DUMITRACHE, Tereza GEORGESCU „Prognoza cerinţei de apă pentru populaţie. Orizontul de timp 2015 -2030" , INHGA - Scientific Conference, "Adaptation to climate change, from source to river basin", Bucharest, November 10-11, 2014 (Proceedings on CD-ROM, ISBN 978-973-0-18825-7, p 129-135

Godeanu Elena, Ionela FLORESCU, Ramona DUMITRACHE, Tereza GEORGESCU „Prognoza cerinţei de apă pentru populaţie. Orizontul de timp 2015 -2030" ,INHGA - Scientific Conference, "Adaptation to climate change, from source to river basin", Bucharest, November 10-11, 2014 (Proceedings on CD-ROM, ISBN 978-973-0-18825-7, p 129-135

Hamchevici C., Mainerici M., 2014, Analiza intercomparabilității datelor de monitoring pentru sectorul comun româno – bulgar al fluviului Dunărea. INHGA Scientific Conference "Adaptation to climate change, from source to river basin", Bucharest, November 10-11, 2014 (Proceedings on CD-ROM, ISBN 978-973-0-18825-7, p 209-216)

Ionita, M., Chelcea, S., Rimbu, N., Adler, M-J., (2014): Spatial and temporal variability of winter streamflow over Romania and its relationship to large-scale atmospheric circulation, Journal of Hydrology, doi: http://dx.doi.org/10.1016/j.jhydrol.2014.09.024

Jipa D. - The Loess-Like Deposits in The Lower Danube Basin. Genetic Significance (2014) GeoEco Marina,No20

Mares, C., Adler, M.J., Mares, I., Chelcea, S., Branescu, E., 2014: Discharge variability in Romania using Palmer indices and a simple atmospheric index of large scale circulation, Hydrological Sciences Journal - Manuscript ID HSJ-2014-0349, (in curs de publicare)

Mătreață M., Magetz C., 2014, Implementation of the real time hydrological forecasting platform in the Danube WATER project. INHGA Scientific Conference “Adaptation to climate change, from source to river basin”, Bucharest, November 10-11, 2014 (Proceedings on CD-ROM, ISBN 978-973-0-18825-7, p 203-207)

Mătreaţă M., Corbuş C., Mic R.P., Mătreaţă S., Pandele A., Emil R., 2014, NIHWM contribution to SNOWBALL project - “Remote sensing, model and in-situ data fusion for snowpack parameters and related hazards in a climate change perspective”, INHGA Scientific Conference, “Adaptation to climate change, from source to river basin”, Bucharest, November 10-11, 2014 (Proceedings on CD-ROM, ISBN 978-973-0-18825-7, p 49-56)

Mătreaţă, M., Mătreaţă, S., 2014, Calibration particularities for the NOAH distributed hydrological model parameters. Application for the Bârlad river basin, INHGA Scientific Conference “Adaptation to climate change, from source to river basin”, Bucharest, November 10-11, 2014 (Proceedings on CD-ROM, ISBN 978-973-0-18825-7, p 93-103)

Mereţ R., Zaharia L., 2014, Mineral waters at Băile Perşani and their use, “Water resources and wetlands” Conference Proceedings,Tulcea, Ed. Transversal Publishing House, Târgovişte, p. 585 – 562. ISSN: 2285-7923.

Mereţ R., Zaharia L., 2014, Research and valorization history of mineral waters in Braşov County, vol. Air and Water Components of the Environment Conference, Cluj- Napoca, E. Casa Cărţii de ştiinţă, pag. 407-414. Indexată în baza de date: DOAJ - DIRECTORY OF OPEN ACCES JOURNALS (ISSN: 2067-743X).

Mic Rodica-Paula, Ciprian Corbuş, Marius Mătreaţă (2014), Calibrarea parametrilor modelului hidrologic CONSUL prin simularea scurgerii în bazinul hidrografic Bârlad. INHGA - Scientific Conference, “Adaptation to climate change, from source to river basin”, Bucharest, November 10-11, 2014 (Proceedings on CD-ROM, ISBN 978-973-0-18825-7, p 37-47)

Miță P., Mătreață S. (2014), Metodă de clacul a valorilor maxime ale coeficientului de scurgere generat din topirea zăpezii, Revista Viitura, 8, p. 20-27.

Mic R., Ciprian Corbuş, Marius Mătreaţă (2014), Calibrarea parametrilor modelului hidrologic CONSUL prin simularea scurgerii în bazinul hidrografic Bârlad. INHGA Scientific Conference, “Adaptation to climate change, from source to river basin”, Bucharest, November 10-11, 2014 (Proceedings on CD-ROM, ISBN 978-973-0-18825-7, p 37-47)

Mic R.P., Ciprian Corbus, (2014). Analysis of potential climate change impact on mean flow in Somes, river basin, Romania, EGU General Assembly 2014, Geophysical Research Abstracts, Vol. 16, EGU2014-10053, 2014

Mic R.P., Ciprian Corbus, (2014): Analysis of potential climate change impact on mean flow in Somes, river basin, Romania, Geophysical Research Abstracts, Vol. 16, EGU2014-10053, 2014

Minea, G. & Moroşanu, G. (2014), Research of Water Balance at Hydrological Micro-Scale in the Aldeni Experimental Basin (Romania). Forum geografic. Studii şi cercetări de geografie şi protecţia mediului, Volume XIII, Issue 2 (December 2014), http://dx.doi.org/10.5775/fg. 2067-4635.2014.104.d, pp. 185-192.

Mirela Iuliana Şundri, Marian - Traian Gomoiu - Zooplankton Features in The Aquatic Area Influenced by Cernavodă Nuclear Power Plant (2014) GeoEco Marina,No20

Moldoveanu M., Tanase I., Lazarine T., "Dimensionarea zonelor de protectie sanitara pentru captarile de apa din rauri. Studiu de caz." Revista Hidrotehnica Vol. 59, nr. 4-5, ISSN 0439-0962, 2014, Bucuresti

Moldoveanu Marinela, Gabriel Chiriac, Geta Rîşnoveanu, Metode exploratorii de analiză şi testare a eficienței setului de indici utilizaţi de sistemul naţional de monitorizare şi evaluare a stării ecologice a sistemelor lotice, Sesiunea Ştiinţifică Studenţească a Facultăţii de Biologie, 30 mai, 2014, Bucureşti, România, p. 59 (Lucrare premiată cu premiul II)

Moroşanu G. A., Zaharia L., 2014, Lacul de acumulare Fântânele şi influenţa sa asupra regimului scurgerii râului Desnăţui, Abstracts volume of the Annual Scientific Conference of the Faculty of Geographie „Changing geographies and societies", 15th November, Bucharest, p. 158-159, ISBN 978-606-16-0548-4.

Musteata G., Isabela BALAN, Claudiu PRICOP, Ioan BALAN, (2014), Studii privind siguranța în exploatare a acumulării Podu Iloaiei. INHGA Scientific Conference "Adaptation to climate change, from source to river basin", Bucharest, November 10-11, 2014 (Proceedings on CD-ROM, ISBN 978-973-0-18825-7, p 119-128)

Neculau G., Zaharia L., 2014, Variation spatiale de l'évaporation de la surface des lacs en Roumanie, Abstracts volume of the Annual Scientific Conference of the Faculty of Geographie „Changing geographies and societies", 15th November, Bucharest, p. 144-145, ISBN 978-606-16-0548-4.

Panaitescu Casen, Cristinel Constandache, Ion Codrut Bilea, Petrisor Vica, Aurel Bilanici, Ion Onutu, 2014, Climate Change impact on the water quality on the Măneciu Cheia Area, Scientific Papers. Series E. Land Reclamation, Earth Observation & Surveying, Environmental Engineering, Vol. III **,** ISSN 2285-6064, ISSN CD-ROM 2285-6072, ISSN-L 2285-6064, Online ISSN 2393-5138

Perju E.R., Zaharia L., 2014, Caracteristics of low flow in Valea Cerbului Catchment, Abstracts volume of the Annual Scientific Conference of National Institute of Hydrology and Water Management and of National Administration „Apele Române", 10 – 11 November, Bucharest, p. 30 – 31, ISBN 978-973-0-17800-6.

Perju R., Zaharia L., 2014, Changes in the frequency and magnitude of floods in the Bucegi Mountains (Romanian Carpathians), "Water resources and wetlands" Conference Proceedings, Tulcea, p. 321 – 328. ISSN: 2285-7923.

Perju R., Zaharia L., Balin D., Lane S., 2014, Changements climatiques dans les Carpates Roumanines, et impacts hydrologiques. Etude de cas : les monts de Bucegi, Actes du XXVIIe Colloque de l'Association Internationale de Climatologie Climat : Système et interractions, 2-5 juillet, Dijon (France), p. 73 – 79. ISBN: 978-2-907-696-20-3.

Pintilie V., Adler MJ - Flood CBA Project for ranking flood protection measures- Best practice in Romania-WATMAN Project, , Revista Hidrotehnica 4-5, ISSN 0439-0962

Piscureanu A., Varasteanu D., Chican I., Ruse M., Dulama M., Arsene C., Deneanu N., Dinculescu D., Gijiu C. L., Mares M., Krezhov K., (2014), Development of new technologies for wastewater processing and conditioning the liquid organic wastes radioactively contaminated from the nuclear power plants. INHGA Scientific Conference "Adaptation to climate change, from source to river basin", Bucharest, November 10-11, 2014 (Proceedings on CD-ROM, ISBN 978-973-0-18825-7, p 217-225)

Prăvălie R., Costache R., 2014, The analysis of the susceptibility of the flash-floods' genesis in the area of the hydrographical basin of Bâsca Chiojdului river, Forum Geografic, Vol. 13, No.2., pp: 39 – 49 (indexed DOAJ, EBSCO PUBLISHING, INDEX COPERNICUS etc.),

Prăvălie R., Zaharia L., Sîrdoev I., Peptenatu D., 2014, L'impact des changements climatiques surla vegetation forestiere au sud-ouest de la Roumanie, Actes du XXVIIe Colloque de l'Association Internationale de Climatologie Climat : Système et interactions, 2-5 juillet Dijon (France), p. 460 – 465, ISBN: 978-2-907-696-20-3.

Rădulescu Daniela, Andreea Gălie, Ileana Tanase, "Assessment the environmental flows using ROEFLOW method", al 10-lea Simpozion Internațional de Ecohidraulică, 26-27 iunie 2014, Trondheim, Norvegia

Rădulescu, D., Chendes, V., Ion, M.B. (2014): Realizarea hărţilor de hazard şi risc pe teritoriul României, conform cerinţelor Directivei 2007/60/CE. Revista „Viitura”, nr. 9, iunie, ISSN: 2067 – 7413, p. 19-23

Rădulescu, D., Ion, M.B., Chendeș, V., (2014): Evaluarea preliminară a riscului la inundaţii pe teritoriul româniei, Revista “Viitura” nr. 8, decembrie, ISSN: 2067 – 7413, p. 14-19

Rădulescu, D., Rândaşu, S., Chendeş, V., Ion, M.B., Mătreaţă, M., Achim, D., Ghiță, E. (2014): Aspecte privind desemnarea zonelor cu risc semnificativ la inundaţii şi elaborarea hărţilor de hazard la inundaţii în Romania în vederea îndeplinirii prevederilor Directivei 2007/60/CE, CD cu Lucrările Conferinţei Științifice Anuale a INHGA 2014, (în curs de publicare)

Rădulescu, D., Rândaşu, S., Chendeş, V., Ion, M.B., Mătreaţă, M., Achim, D., Ghiță, E. (2014): Aspecte privind desemnarea zonelor cu risc semnificativ la inundaţii şi elaborarea hărţilor de hazard la inundaţii în Romania în vederea îndeplinirii prevederilor Directivei 2007/60/CE, INHGA Scientific Conference “Adaptation to climate change, from source to river basin”, Bucharest, November 10-11, 2014 (Proceedings on CD-ROM, ISBN 978-973-0-18825-7, p 105-117)

Retegan, M., Borcan, Mihaela, (2014): Assessment of the potential impact of climate change upon surface water resources in the Ialomița River Basin from Romania, Proceedings (BDI) „14th GeoConference on Water Resources. Forest, Marine and Ocean Ecosystems”, 17-26 iunie 2014, Albena, Bulgaria, în Proc., I, p. 89 – 96. DOI: 10.5593/SGEM2014/B31/S12.012

Rojanschi V., (2014), Comunicare si inundații în contextul managementului integrat al resurselor de apă. INHGA Scientific Conference “Adaptation to climate change, from source to river basin”, Bucharest, November 10-11, 2014 (Proceedings on CD-ROM, ISBN 978-973-0-18825-7, p 153-157)

Serio F., Mouldi BEN MEFTAH, Michele MOSSA -Monitoring and Modelling of Coastal Currents and Wastewater Discharge: a Case Study The Loess-Like Deposits in The Lower Danube Basin. Genetic Significance (2014) GeoEco Marina,No20

Stan F., Neculau G., Zaharia L., Ioana-Toroimac G., 2014, Variabilité de l’évapotranspiration pour différent types de végétation dans les stations expérimentales de mesures évaporimétriques en Roumanie, Actes du XXVIIe Colloque de l’Association Internationale de Climatologie Climat : Système et interractions, 2-5 juillet, Dijon (France), p. 92 – 98.

Stan Florentina, Neculau Gianina (2014), Implementation of some calculation methods of the evaporation in the catchments of Prut and Barlad Rivers, Air and water components of the environment, ISSN:2067-743X, pag, 219-226, Cluj Napoca.

Stan Florentina, Neculau Gianina, Zaharia Liliana, Ioana Toroimac G. (2014), Variabilité de l’évapotranspiration pour différentes types de végétation aux stations évaporimétriques expérimentales de Roumanie, XXVII Colloque de l’Association Internationale de Climatologie, Editeures scientifiques Pierre Camberlin et Yves Richard, Climat: Systeme & Interactions, pag. 92-97, Dijon – France.

Tanase I., "Caracteristici hidrologice ale unor râuri cu scurgere nepermanentă din spaţiul hidrografic Crişuri", Conferinţa anuala de comunicări ştiinţifice a Facultăţii de Geografie "Changing geographies and societies", 2014, Bucuresti

Tanase I., Moldoveanu M., Zaharia L., "Caracteristici ale scurgerii minime in bazinul hidrografic Vedea si implicaţii ecologice", al IX-lea simpozion internaţional "Mediul actual si dezvoltarea durabila" organizat de Universitatea Al. I. Cuza din Iaşi, Facultatea de Geografie si Geologie.

Tanase Ileana, Daniela Radulescu, Andreea Galie, "The application of some methods for computation the flows for protection of aquatic ecosystems downstream of reservoir", Conferinţa "Aerul si apa - Componente ale mediului", Cluj-Napoca, 2014, pag 126-134, ISSN: 2067-743X

Tao Song, Linqiang Pan, A Small Universal Spiking Neural P System with Cooperating Rules,pp. 177–189, ROMANIAN ACADEMY,SECTION FOR INFORMATION SCIENCE AND TECHNOLOGY, Volume 17, Number 2, 2014

Tecuci I., Marinela Moldoveanu, "The assessment of hydromorphological status of Romanian rivers, Conferinţa „Aerul şi apa, componente ale mediului", Ediţia 2014, 21-22 martie, Cluj-Napoca, România, p. 79-85 (ISSN: 2067-743X)

Teodor S. (2014), Evaluări ale aportului lateral solid pe perioada extremelor hidrologice în acumulările aflate în cascadă pe râul Olt, Viitura, 8, p. 10-13.

Toroimac G., 2014, Protection et restauration de la plaine inondable du Danube (Roumanie) : de l'état des lieux au cas du Lac Suhaia, Développement durable et territoires, vol. 5, nr. 3, doi : 10.4000/developpementdurable.10550, ISSN 1772-9971, indexat DOAJ.

Toroimac G., 2015, Historical flood risk management: spatial expansion of Gherghiţa village (Lower Prahova River), Volumul Air and Water – components of the environment, pp. 454-461, ISSN 2067-743X, indexat EBSCO, ULRICHSWEB, DOAJ.

Toroimac G., Zaharia L., Minea G., Sârbu I., 2014, Starea hidromorfologică a sectorului cu meandre a râului Prahova, Abstracts volume of the Annual Scientific Conference of the Faculty of Geographie „Changing geographies and societies", 15th November, Bucharest, p. 166-167, ISBN 978-606-16-0548-4.

Toroimac G., Zaharia L., Minea G., Zarea R., 2014, A short-term analysis of human and hydrological impacts on morphological parameters of braided rivers, "Water resources and wetlands" Conference Proceedings, Tulcea, p. 477- 484. ISSN: 2285-7923.

Voicu R., Ecaterina Luca, Liliana Voicu, „Fish Migration Upstream The Weir Placed Near The Ferdinand Bridge Of Oradea City", International Conference "Water resources and wetlands", September 11-13, 2014, Tulcea, România.

Voicu Răzvan, "Solution to creating a fish migration system over the bottom/discharge sill on the Somesul Mic River near the town of Gherla", Lakes, reservoirs and ponds, vol. 8(2), 2014. ©Romanian Limnogeographical Association.

Voicu Răzvan, Ecaterina Luca, Fish Pass Innovations for the Weir of Velenta Bridge from Oradea City", Lakes, reservoirs and ponds, vol. 8(1): 18-27, 2014. ©Romanian Limnogeographical Association.

Voicu Răzvan, Ecaterina Luca, Tehnical solutions for ensuring fish migration upstream and downstream the Oradea power plant, 14 th GeoConference on water resources. Forest, Marine and ocean Ecosystems, International Multidisciplinary Scientific Geoconference 17-26 June SGEM2014, Albena, Bulgaria. Conference Proceedings: Section Hydrology and Water Resources, vol. I, pp.691-698, 2014, ISSN 1314-2704, DOI: 10.5593/sgem2014B31.

Zaharia L., 2014, Towards a lower social vulnerability to floods by education and information, Abstracts volume of the Annual Scientific Conference of National Institute of Hydrology and Water Management and of National Administration „Apele Române", 10 – 11 November, Bucharest, p. 14 – 15, ISBN 978-973-0-17800-6.

Zaharia L., Ioana-Toroimac G., Cocoş O., Soare M., Mailat E., 2014, Hydrological effects of human interventions on the stream system in Bucharest city area, Book of abstracts, International Scientific Conference " Water sustainability: new challenges and solutions", hosted by Commission for Water Sustainability of the International Geographical Union, 24th – 28th August, Dubrovnik (Croatia), p. 37 – 38. ISBN: 978-953-7245-14-6.

Zaharia L., Ioana-Toroimac G., Dumitru-Ostachie L., Crăciun E., 2014, Lessons learned from disatruous floods: the case of Tecuci City (Romania), Proceedings of Danube Conference 2014 “Bridging the sciences – crossing borders”, Deggendorf (Germany), p. 207-210.

Zaharia L., Nedelea A., Comănescu L., Ioana-Toroimac G., Săftoiu L., Costache R., Crăciun E., Flood risk perception and education assessment. Case study: floods in September 2013 in Galaţi County, “Water resources and wetlands” Conference – Book of abstracts, Tulcea, p. 128. ISBN: 978-606-605-72-2.

2015

Adler M-J., (2014), Prezentare generala pentru Proiectul Danube WATER, Revista Hidrotehnica

Corbuş C., Mic R.-P., Mătreaţă M. Estimarea impactului schimbărilor climatice potenţiale asupra scurgerii maxime din bazinul hidrografic Olt, Revista Hidrotehnica (in press)

Mic R.P., Corbuș C., Mătreaţă M., 2015, Projected impacts of climate change on the flow regime from Bârlad River Basin, Romania. Geophysical Research Abstracts, Vol. 17, EGU2015-9715, 2015, EGU General Assembly 2015

Mic R.P., Corbuș C., Mătreaţă M., Alexandru Preda Al., 2015, Regionalization of CONSUL Hydrological Model Parameters for Flow Simulation in the Barlad River Basin, Romania, Proceedings SGEM GeoConferences 2015, (in press).

Mic Rodica Paula, Ciprian Corbuş, Marius Mătreaţă, 2015, Projected impacts of climate change on the flow regime from Bârlad River Basin, Romania. EGU General Assembly 2014, Geophysical Research Abstracts Vol. 17, EGU2015-9715, 2015

Radu E., Stanescu G., Rotaru C., 2015, “Considerații geologice şi hidrogeologice privind depozitele cuaternare din bazinul Crisului Alb, între Vărșand și Sebiș (proiect CLIMHYDEX)”, Proceedings Conferinţa “Aerul şi apa, componente ale mediului”, Universitatea Babeş – Bolyai Cluj Napoca , 20-22 martie 2015.

Stan Florentina, Zaharia Liliana, Neculau Gianina, Ioana Toroimac G. (2015) „Variabilité spatiale et temporelle de l’évaporation dans la Plaine roumaine”, XXVIII Colloque Annuel de l’Association Internationale de Climatologie, Liege – Belgia (in press).

Tănase I., Zaharia L., 2015, Impact of the reservoirs on the river low flow and measures to mitigate the negative effects, vol. Air and Water Components of the Environment Conference, Cluj-Napoca, E. Casa Cărţii de Ştiinţă, pag. 332-339. Indexată în baza de date: DOAJ - DIRECTORY OF OPEN ACCES JOURNALS, EBSCOhost - world's foremost premium research database service,ULRICHSWEB, Academic Journals Database (ISSN: 2067-743X).

Zaharia L., Ioana-Toroimac G., Costache R., Crăciun E., 2015, The flood potential and measures for flood risk mitigation in Tecuci City, vol. Air and Water Components of the Environment Conference, Cluj- Napoca, E. Casa Cărţii de Ştiinţă, pag. 56-63. Indexată în baza de date: DOAJ - DIRECTORY OF OPEN ACCES JOURNALS, EBSCOhost - world's foremost premium research database service,ULRICHSWEB, Academic Journals Database (ISSN: 2067-743X).

BOOKS

- MANAGING PROTECTED AREAS IN CENTRAL AND EASTERN EUROPE UNDER CLIMATE CHANGE, 2014, EDITORS(S): SVEN RANNOW, MARCO NEUBERT, NO. OF PAGES: 308, ISSN 1574-0919
  ISBN 978-94-007-7959-4 ISBN 978-94-007-7960-0 (EBOOK), DOI 10.1007/978-94-007-7960-0, SPRINGER
- MINING AND RIVER POLLUTION IN THE METALIFERI MOUNTAINS. APPLICATIONS IN THE CRIŞUL ALB AND CERTEJ RIVER BASINS MIHAELA SIMA, 2014
- CROSS-BORDER CO-OPERATION EURO-REGIONS IN THE LOWER DANUBE BASIN. GEOGRAPHICAL STUDYRADU SĂGEATĂ (COORD.), 2014
- THE URBAN SYSTEMS IN THE AGE OF GLOBALIZATION. GEOGRAPHICAL STUDIES WITH FOCUS ON ROMANIA RADU SĂGEATĂ, 2014
- THE DANUBE DELTA - GEOGRAPHICAL ENVIRONMENT AND SOCIAL RISK FACTORS NICOLETA DAMIAN, 2013
- THE RODNA MOUNTAINS NATIONAL PARK. MAN-ENVIRONMENT RELATIONS GHEORGHE KUCSICSA, 2013
- THE SUBCARPATHIAN DEPRESSIONS OF OLTENIA BETWEEN THE JIU AND THE BISTRIŢA VÂLCII RIVERS. HUMAN GEOGRAPHY MIHAELA PERSU, 2012
- SÃGEATÃ, RADU, TODERAS, TEODOR, NEGOESCU, ALINA, CRACEA, TRAIAN (2013), METHODOLOGY FOR ASSESSING VULNERABILITY TO FLOODS IN ROMANIAN CITIES, WULFENIA JOURNAL, VOL. 20, NO. 11.
- ELENA-ANA POPOVICI, DAN BĂLTEANU, GHEORGHE KUCSICSA, (2013), ASSESSMENT OF CHANGES IN LAND-USE AND LAND-COVER PATTERN IN ROMANIA USING CORINE LAND COVER DATABASE, CARPATHIAN JOURNAL OF EARTH AND ENVIRONMENTAL SCIENCES, VOL. 8, NO. 4
- ADINA-ELIZA, CROITORU, ADRIAN, PITICAR, CARMEN SOFIA, DRAGOTÃ, DOINA CRISTINA, BURADA (2013), RECENT CHANGES IN REFERENCE EVAPOTRANSPIRATION IN ROMANIA, GLOBAL AND PLANETARY CHANGE, VOL. 111, ELSEVIER
- MITRICÃ, EUGEN, MITRICÃ, BIANCA, STÃNCULESCU, ANDREI, (2013), ECONOMIC ANALYSIS OF NATURE PRESERVATION INVESTMENTS: THE ZONAL COST APPROACH APPLIED FOR HARGHITA COUNTY OF ROMANIA, ENVIRONMENTAL AND ECOLOGICAL STATISTICS, VOL. 20, NO. 1.
- CARMEN-SOFIA, DRAGOTA, INES, GRIGORESCU, MONICA, DUMITRASCU, COSTIN, DUMITRASCU (2013),REGIONALIZATION OF THE MAIN CLIMATIC HAZARD PHENOMENA IN THE SOUTH-WEST DEVELOPMENT REGION. ROMANIA, JOKULL JOURNAL, VOL. 63, ISSUE 7.
- DRAGOTÃ, CARMEN-SOFIA, KUCSICSA, GH. (2011), GLOBAL CLIMATE CHANGE-RELATED PARTICULARITIES IN THE RODNEI MOUNTAINS NATIONAL PARK, CARPATHIAN JOURNAL OF EARTH AND ENVIRONMENTAL SCIENCES, VOL. 6, NO. 1.

Chapter 6. Romanian publictions - Journals including hydrological papers and list of annual scientific events, publishing proceedings

SCIENTIFIC MANIFESTATIONS publishing proceedings

WORKSHOPS/ CONFERENCES:

- ✓ International Conference Danube - Black Sea 3E - Energy, Environment & Efficiency 2013, Galati, Romania
- ✓ INCD ECOIND-International Symposium-SIMI 2013 "The Environment and the Industry", Bucharest, Romania,
- ✓ Sesiunea Ştiinţifică Studenţească a Facultăţii de Biologie, 31 mai, Bucureşti,
- ✓ Annual Conference of the Faculty of Physics, University of Bucharest,
- ✓ Conferinţa anuală a Facultăţii de Hidrotehnică, Geodezie şi Ingineria Mediului a Universităţii Tehnice „Gh. Asachi”, 11-12 octombrie 2013, Iasi,
- ✓ Lucrarile Seminarului Geografic „Dimitrie Cantemir”, 18-20 octombrie, 2013, Iasi,
- ✓ Conferinta Utilizatorilor Esri, Trimble si Exelis, 20 de ani de GIS in Romania, Bucuresti - Romexpo - Sala Madgearu 27 Septembrie 2013 - http://evenimente.esriro.ro/#sthash.DL4eCCWa.dpuf
- ✓ Symposium Environment, Society and Geospatial Technology, Faculty of Geography, University of Bucharest,
- ✓ Simpozionul ştiinţific „Grigore Cobălcescu” 150 de ani de învăţămînt geologic în România, 26 octombrie, 2013, Iaşi,
- ✓ Conferinţa "Aerul şi apa, component ale mediului", editions 22-23 martie 2013, , 21-22 martie, 2014, Cluj-Napoca
- ✓ CEE NBO - Central and Eastern European Network of Basin Organisations Conference, 12-15 November, 2014, Bucharest,
- ✓ Annual Conferece Air and Water Components of the Environment Conference, Cluj-Napoca – orgainsed by Babeş-Bolyai University, Faculty of Geography, Department of Physical and Technical Geography, March 2012, 2013, 2014, 2015
- ✓ International Conference "Water resources and wetlands", September 11-13, 2014, Tulcea, România
- ✓ Annual Conference “Environemntal aspects and available scientific tools for Black Sea Basin protection”, Tulcea, Romania
- ✓ Conferinţa Anuală INHGA/Annual Conference INHGA - „Adaptaton to climate change, from source to river basin”, 10-11.11, Bucureşti 2014
- ✓ al IX-lea simpozion internaţional "Mediul actual și dezvoltarea durabilă" organizat de Universitatea Al. I. Cuza din Iaşi, Facultatea de Geografie și Geologie;
- ✓ Conferinţa anuală de comunicări ştiinţifice a Facultăţii de Geografie "Changing geographies and societies", 2014, Bucuresti
- ✓ "Mediul actual si dezvoltarea durabila" organizat de Universitatea Al. I. Cuza din Iaşi, Facultatea de Geografie si Geologie
- ✓ Workshop: “10th Workshop on Mathematical Modelling of Environmental and Life Sciences Problems” (16-19 octombrie 2014) – Ediția a 10-a, Ovidus University
- ✓ New tools for sustainable management of aquatic living reaosurces AQUALIRES 2014, 17-28 January, 2015
- ✓ 24th International Conference “Water resources and wetlands”, Tulcea, May 2015
- ✓ Annual workshops dedicated to World Water Day (2012, 2013, 2014) organized by the Faculty of Geography, University of Bucharest (main organizer D. Diaconu)

- ✓ Water and alimentary security, University of Bucharest, 23.03.2012, http://www.unwater.org/worldwaterday/events
- ✓ International Year of Water Cooperation, organized by Faculty of Geography - University of Bucharest, Romanian Limnogeographical Association Romanian Limnogeographical Association (ARLG), National Library of Romania, 20.03.2013. http://www.unwater.org/water-cooperation-2013/events/worldwide-events/world-map-view/en/
- ✓ A Drop of Water for the Future, 18.03.2014, organized by Faculty of Geography - University of Bucharest, Romanian Limnogeographical Association, NAM S.A., “Grigore Antipa” National Museum of Natural History.
- ✓ International Conference Water resources and wetlands, Tulcea, September 14–16 2012. Faculty of Geography, University of Bucharest was partner in the conference organizing. Main organizer: ARLG,http://www.limnology.ro/water%20and%20wetlands%202012.html
- ✓ International Conference Water resources and wetlands, Tulcea, September 11 - 13 2014 Faculty of Geography, University of Bucharest was partner in the conference organizing. Main organizer: ARLG http://www.limnology.ro/water2014.html
- ✓ Annual Conferences of the Faculty of Geografy, University of Bucharest, with topic on Hydrology
- ✓ International Conference Environment – Landscape – European Identity, 4-6 November 2011, Bucharest
- ✓ International Conference Understunding Land, People and Environment, 10 -11 November 2012, Bucharest
- ✓ International Conference Environment, Society and Geospatial Technology, 16-17 November 2013, Bucharest
- ✓ International Conference Changing Geographies and Societies, 15 November 2014, Bucharest

EXHIBITIONS:

- Târgul internaţional ECOMEDIU – ediţiIle a -X-a – a XI-a, Arad, 15-17.10.2014
- EXPOAPA 2011, 2013, 2014, Palatul Parlamentului(16-18 iunie, 2014)

ROMANIAN JOURNALS PUBLISHING HYDROLOGICAL PAPERS:

- ➢ ***«Hidrotechnica» Journal, National Administration “Romanian Waters*** (bienal) ***www.rowater.ro;***
- ➢ ***Civil Engineering Journal, Ovidius University,*** (bienal)***;***
- ➢ ***Mathematical Modelling in Civil Engineering, Technical University of Civil Engineering, Bucharest,http://mmce.rs.utcb.ro/wiew-articles/archive1.html;***
- ➢ ***Geo-Eco-Marina Journal, GeoEcoMar Journal, Bucharest;***
- ➢ ***Annals of Natural Sciences, Biology – Ecology Series / Ed. University of Constanta;***
- ➢ ***Scientific Papers. Series E. Land Reclamation, Earth Observation&Surveying, Environmental Engineering, Ed. USAMV Bucharest*** (bienal)

- ***Scientific Annals of the Danube Delta Institute, Tulcea;***
- ***DELTAICA, DDNI, Tulcea,*** (bienal)***;***
- ***REVUE ROUMAINE DE GÉOGRAPHIE / ROMANIAN JOURNAL OF GEOGRAPHY***
- ***REVISTA GEOGRAFICĂ / GEOGRAPHICAL JOURNAL***
- ***STUDII SI CERCETARI DE GEOGRAFIE***
- ***Analele Universităţii din Bucureşti*, *seria Geografie*,** Ed. Universităţii Bucureşti (annually)
- ***Revista de Geomorfologie* ,** Ed. Universităţii Bucureşti (bienal)
- ***Lakes, reservoirs and ponds,*** Ed. Transversal Târgovişte (bienal)
- ***Riscuri şi catastrofe*,** Ed. Casa Cărţii de ştiinţă Cluj-Napoca (bienal)
- ***Geographia Technica****,* Cluj University Press (bienal)
- ***Studia Universitatis Babeş Bolyai, Geographia,*** Cluj University Press (bienal)
- ***Scientific Annals of "Alexandru Ioan Cuza" University of Iasi – Geography*** (bienal)
- ***Forum geografic (****Geographical Phorum), Universitaria Craiova* (bienal)
- ***Cercetari Marine - Recherches Marines (bienal), National Institute for Marine Research and Development "Grigore Antipa" (NIMRD), http://www.rmri.ro/***

IAMAS ACTIVITIES IN ROMANIA

2011-2014

Romanian IAMAS Committee

National Correspondents:
Co-Presidents of the Committee:

Prof. Dr. Sabina STEFAN
University of Bucharest, Faculty of Physics
Dept. of Atmospheric Physics
P.O.BOX MG-11
077125, Magurele, Bucharest, ROMANIA
Phone &Fax: +40 21 4574521
E-mail: sabina.stefan@fizica.unibuc.ro; sabina_stefan@yahoo.com

Dr. Gheorghe STANCALIE
National Meteorological Administration
Soseaua Bucuresti – Ploiesti Nr. 97.
013686 Bucharest, ROMANIA
Phone & Fax: +40 21 3166098
E-mail: gheorghe.stancalie@meteoromania.ro

Members:

Dr. Florinela Georgescu
National Meteorological Administration
Soseaua Bucuresti – Ploiesti Nr. 97.
013686 Bucharest, ROMANIA
Phone&Fax : +40 21 3163732
E-mail : florinela.georgescu@meteoromania.ro

Dr. Rodica Dumitrache
National Meteorological Administration
Soseaua Bucuresti – Ploiesti Nr. 97.
013686 Bucharest, ROMANIA
Phone and Fax: +40 21 3166098
E-mail : rodica.dumitrache@meteoromania.ro

Claudia RADU
Romanian Civil Aeronautical Authority
Sos. Bucuresti-Ploiesti nr. 38-40, 013695 Bucharest, ROMANIA
Phone: +40-21-2081515
Fax: +40-21-2081565
E-mail: claudia.radu@caa.ro

Secretary:

Dr. Sorin Burcea
National Meteorological Administration
Soseaua Bucuresti – Ploiesti 97
013686 Bucharest, ROMANIA
Phone: +40 21 3166098
Fax : +40 21 3167762
E-mail : sorin.burcea@meteoromania.ro

PART I: ORGANIZATION

The International Association of Meteorology and Atmospheric Sciences (IAMAS) Organization for Romania, a Section of the Romanian National International Union of Geodesy and Geophysics (IUGG) Committee, was constituted at the National Meteorological Administration (the former National Institute of Meteorology and Hydrology - Bucharest) in cooperation with the Faculty of Physics, Department of Atmosphere Physics of the University of Bucharest.

The National Meteorological Administration (NMA) represents the national service in the field of meteorology and the General Manager is the Permanent Representative of Romania with the World Meteorological Organization (WMO). The Scientific Manager is the co-president of IAMAS for Romania. The main activities developed within NMA are: *basic operational activity* (weather forecast, observation system, telecommunication, climatological database), *research activity* (numerical modeling, climate variability and climate change, physics of the atmosphere, air pollution, remote sensing and GIS, agrometeorology), *education and training and international cooperation.* At the Faculty of Physics, the Department of Atmosphere Physics, the students and the teachers work in the fields of Dynamic Meteorology, Physics of Climate, Thermodynamic and Radiation of the Atmosphere, Electricity of the Atmosphere and they collaborate with the researchers from NMA. Many research laboratories in the field of air and water pollution monitoring are present at the National Institute of Environment Research and Engineering (ICIM - Bucharest). Studies related to upper air are being performed especially at the Astronomical Institute (that IAMAS - Romania intends to attract within the association the next year) and ROMATSA. ROMATSA includes a National Center of Aeronautic Meteorology with 17 offices and airport meteorological stations, units corresponding to the OACI standards.

IAMAS has 10 commissions:

- International Commission on Atmospheric Chemistry and Global Pollution
- (ICACGP);
- International Commission on Atmospheric Electricity (ICAE);
- International Commission on Climate (ICCL);
- International Commission on Clouds and Precipitation (ICCP);
- International Commission on Dynamical Meteorology (ICDM);
- International Commission on the Middle Atmosphere (ICMA);
- International Ozone Commission (IOC);
- International Commission on Planetary Atmospheres and their Evolution (ICPAE);
- International Commission on Polar Meteorology (ICPM);
- International Radiation Commission (IRC).

The general objectives of IAMAS (to promote the study of the science of the atmosphere, to initiate, facilitate and coordinate international cooperation, to stimulate discussion, presentation and publication of scientific results, to promote education and public awareness) are also the objectives of the organization in Romania, although the activities related to these sections are different, some sections, such as: dynamic meteorology, climatology or air pollution enjoying more interest as against upper air or polar meteorology. In this view, we should mention the significant participation of the Romanian researchers in the international programs, especially the European ones, such as ALADIN, ETEX, and CLIVAR.

The Romanian Meteorological Society also supports the IAMAS activities for Romania.

Romanian IAMAS Activities

- **Dynamic Meteorology**
- **Climate**
- **Atmospheric Physics**
- **Agrometeorology**
- **Remote sensing and GIS**
- **Nowcasting**

Professional Organizations

- **Romanian Meteorological Society**

Institutions

- **National Meteorological Administration (NMA)**
- **Institute of Environment Research and Engineering (ICIM)**
- **Romanian Civil Authority for Aeronautics (ROMATSA)**
- **University of Bucharest:**
  Faculty of Physics
  Faculty of Geography

National Conferences

- **Annual Scientific Session of the National Meteorological Administration**
- **Annual Scientific Session of the Faculty of Physics, University of Bucharest**
- **Annual Conference of Physics**

Publications

- **Romanian Journal of Meteorology**
- **Romanian Reports in Physics**
- **Romanian Journal of Physics**

PART II: PROFESSIONAL ACTIVITY

DYNAMIC METEOROLOGY

1. Research orientation

The research activity in meteorology developed the main activity domains: numerical atmospheric modeling and modeling of the pollutant transport, climatic modeling and studies (climate variability, climate change and climatic forecasting), studies on the physics of the atmosphere and of the ozone layer, studies based on satellite techniques, remote sensing and GIS, as well as studies of the climatic conditions impact on crops.

The results of the research activity were presented at internal and international scientific meetings and were published in specialized Romanian and international journals.

1.1. COSMO numerical weather prediction model

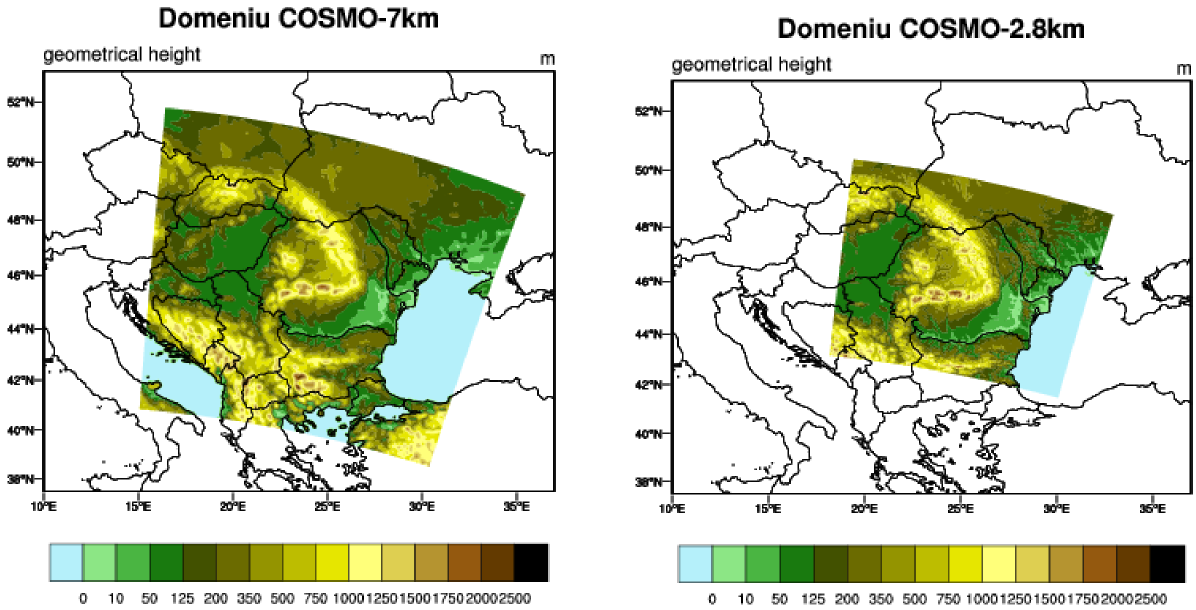
The non-hydrostatic atmospheric forecasting model COSMO is being running operationally at the National Meteorological Administration ever since 2005. Starting the second half of 2013, version 4.25 of the COSMO non-hydrostatic model is being operationally integrated for two horizontal resolutions of 7 km and 2.8 km respectively, four times a day, at 00, 06, 12 and 18 UTC. For the integrations of 00 and 12 UTC, COSMO limited area prediction model is run at a 7-km spatial resolution, for an anticipation of 78 hours, having 40 vertical levels and it uses as input data the forecasts supplied by the GME global model.

For the 2.8-km integration, the used initial and boundary conditions are obtained by applying a procedure of interpolating the results from running the model at the 7-km horizontal resolution. The model is multiprocessor-run for an anticipation of 30 hours (the integration for 00 UTC) and of 18 hours respectively (the integration for 12 UTC), having 50 vertical levels. For the integrations at 06 and 18 UTC respectively, the COSMO limited area numerical model is integrated at a spatial resolution of 2.8 km over an anticipation interval of 18 hours. The initial and boundary conditions necessary for the model to be run are obtained through interpolating the results of COSMO model, integrated at the 7-km resolution.

Starting 2009, COSMO model is being operationally integrated at the 7-km resolution, using SYNOP data assimilation. Observation data in BUFR format are processed in AOF format to be used in data assimilation.

To simplify data assimilation procedures but also in order to use all available observation data types, from the latter half of 2013 COSMO model is being operationally integrated at the 7-km spatial resolution using SYNOP-type observation data in netcdf format. Also, starting the same 2013 the limited area COSMO model is being integrated at the 2.8-km resolution, using SYNOP data assimilation in netcdf format and radar data in grib 1 format. The integration procedure for COSMO numerical model at the two horizontal resolutions with data assimilation is of the nudgecast type, using nudging-type schemes (7m) and nudging + latent heat nudging for the assimilation of observation data.

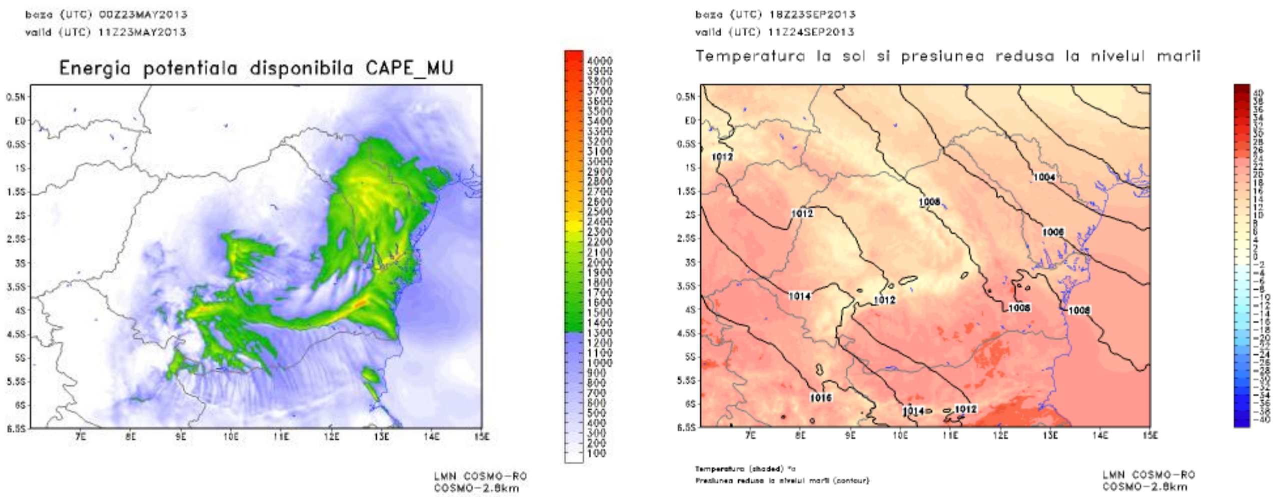
The operational integration domain for COSMO model at the 7-km horizontal resolution is 201x177 grid points and it is 361x291 grid points at the 2.8- km horizontal resolution.



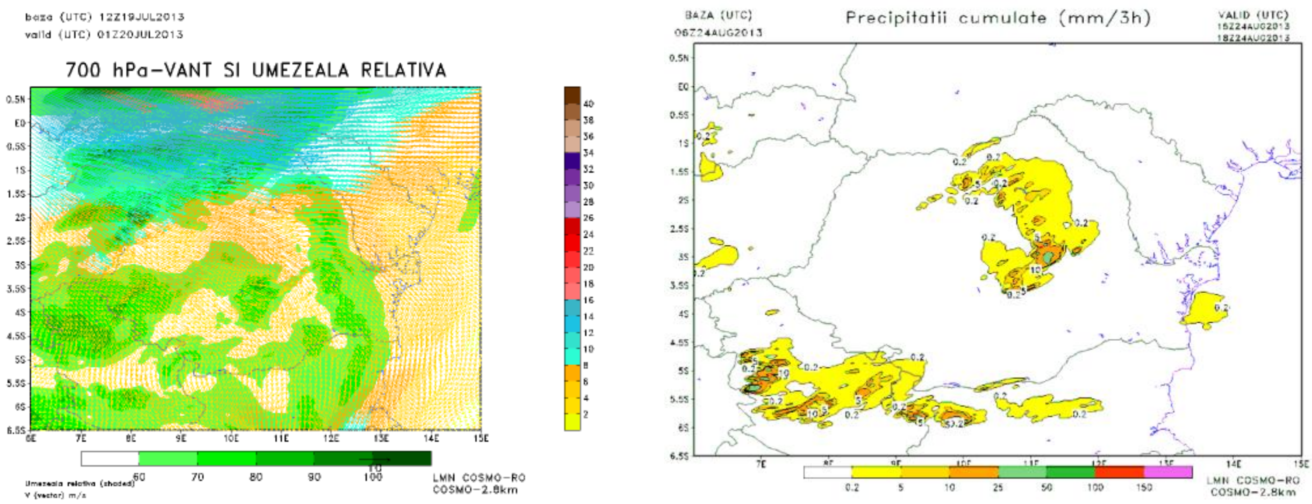
a) b)

Operational integration domains for COSMO non-hydrostatic numerical model: a) 7-km horizontal resolution; b) 2.8-km horizontal resolution.

The results of integrating COSMO numerical model at the 7-km horizontal resolution (at 00 UTC and 12 UTC) and at the 2.8-km horizontal resolution (at 00 UTC, 06 UTC, 12 UTC and 18 UTC) are rendered in graph form, so as to be used by forecasters. The displayed meteorological parameters include: air temperature, ground temperature and sea-level pressure, wind speed and direction, relative moisture, precipitation a.s.o.



a) b)

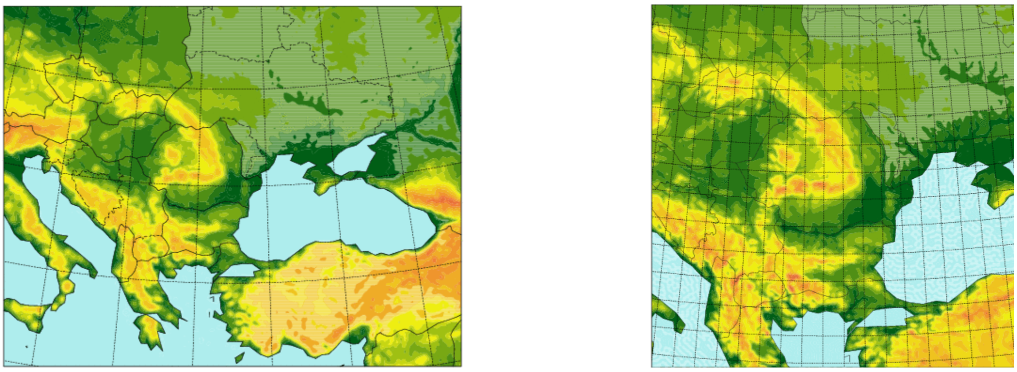


c) d)

Examples of graph representations of the results of integrating COSMO numerical model at the 2.8- km horizontal resolution: a) Convective Available Potential Energy CAPE_MU – 23 May 2013, 11 UTC (integration of 00 UTC); b) ground temperature and sea-level pressure – 24 September 2013, 18 UTC (integration of 18 UTC); c) Wind speed and direction and relative moisture at the level of 700 hPa – 01 July 2013, 12 UTC (integration of 12 UTC); d) 3-h Accumulated precipitation over 24 August 2013, 15 UTC – 24 August 2013, 18 UTC (integration of 06 UTC).

1.2. ALARO numerical weather prediction model

ALARO-0 model is integrated four times a day over a domain named ALARO Romania containing 240x240 grid points, with a horizontal resolution of 6.5 km.



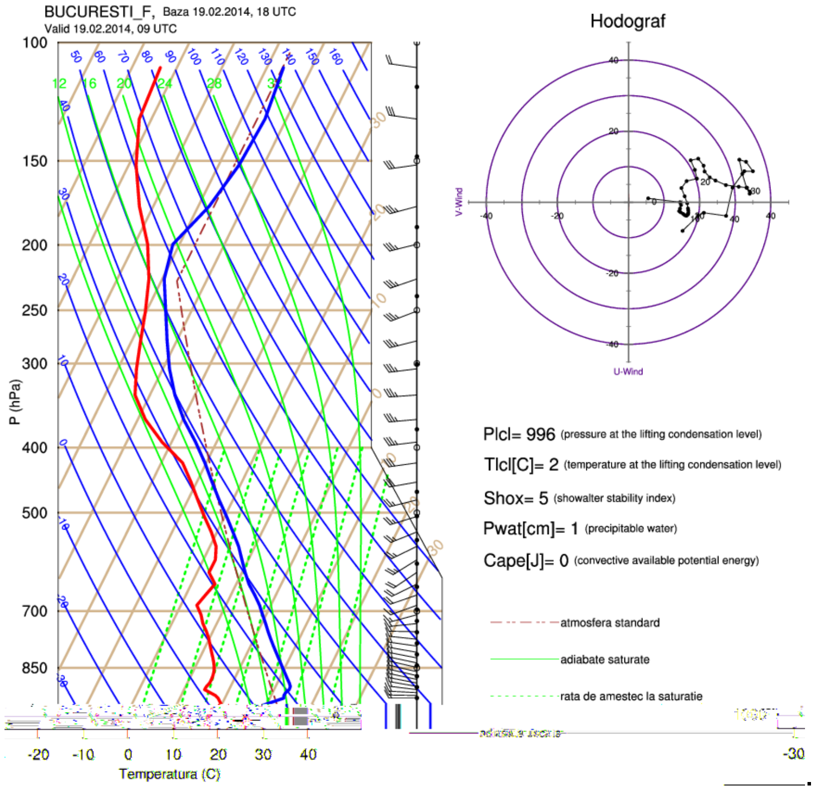
Integration domains and orography of the model: ALARO-Romania – left, ALARO-Selam – right.

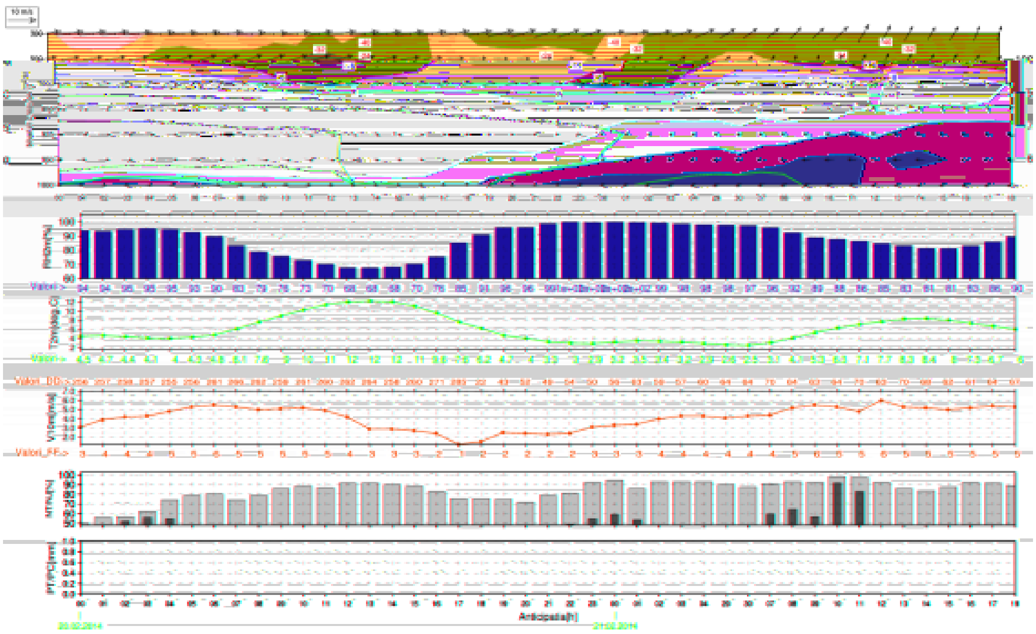
Also, ALARO model in operationally integrated twice a day over a wider domain (SELAM domain), yet at a poorer resolution (11.5 km), its outputs being the atmospheric “inputs“ for the marine applications (wave and marine circulation models).

There was sustained activity within the group with respect to implementing and testing a new version of ALARO model, following recent developments of the parametrization of moist processes within the RC-LACE consortium. Modifications concern:

- parametrization of deep convection, recent modifications (rallying rate of the environmental air from the convective cloud, un-rallying rate and the closure hypothesis) especially aiming at stimulating the diurnal cycle of convective precipitation, which, in the present-day operational version starts too early in the morning and ends too fast in the afternoon;

- thermodynamic ajustement, using the slightly modified Xu-Randall formula in this scheme;
- microphysical processes.





The new ALARO-0 version which includes all the above-described modifications has been implemented on the Linux IBM/BLADE cluster. Experiments were thus performed for specific situations, favourable to testing those modifications, so as to verify the model's sensitivity to various parameters, pertaining more to the local configuration. Following the tests, the optimal configuration was set and a parallel chain was launched during three months. Analysis of the results showed an improvement of the model's performance, which triggered the model to become operational starting 1 January 2014.

In this configuration the number of vertical levels increased from 49 to 60 (for a better representation of the planetary boundary layer) and the passage was made from the vertical discretization in finite differences to the discretization through finite element, and the time step was shortened from 300 to 240 s.

Diversification and improvement of the graph products proceeded through introducing the meteograms and the skewT diagrams on the Intranet server.

At the same time, the operational chain based on the ALADIN model was maintained as a backup solution.

The research-development activity unfolded by the group mainly took place within ALADIN and RC-LACE projects. The Romanian team contributed to:

- validating and testing the parametrization scheme of the complementary upward / downward currents below the grid;
- analysing the sensitivity of the AROME model to the chosen SL scheme, as well as to the horizontal and vertical resolution respectively;

developing the verification system of the LACE (LAEF) limited area forecasting ensemble, an important step being the adaptation of the programs/ shell scripts in the PERL programming language, followed by the rewriting of the FORTRAN programs, as well as their adaptation for the computation of the deterministic and probabilistic scores.

1.3. Statistical adaptation and weather forecasts verification

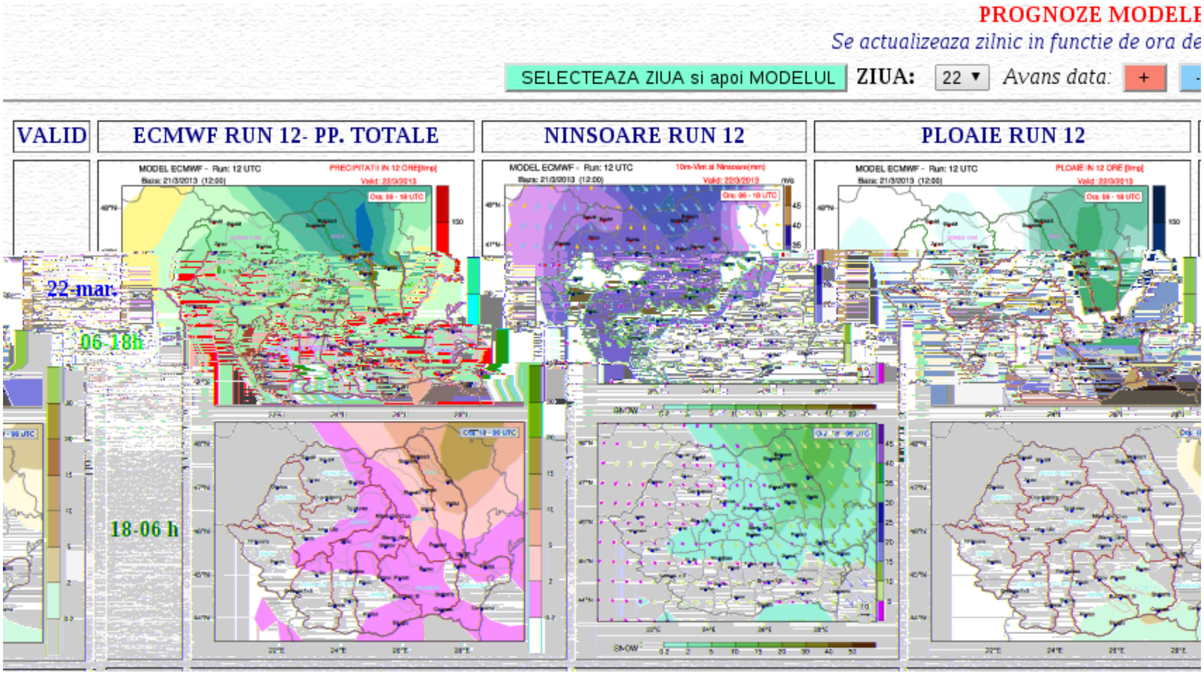
The following were achieved in the **verification and statistical post-processing** activity as regards forecasts yielded by numerical models:

- A new MOS_ALADIN operational chain for four terms: 00, 06, 12, 18 UTC;
- New procedures for displaying on the web the forecasting parameters from the numerical models specific to the winter season;
- Displaying on the web the forecasting parameters from the numerical models: EPS and marine forecast – WAM.

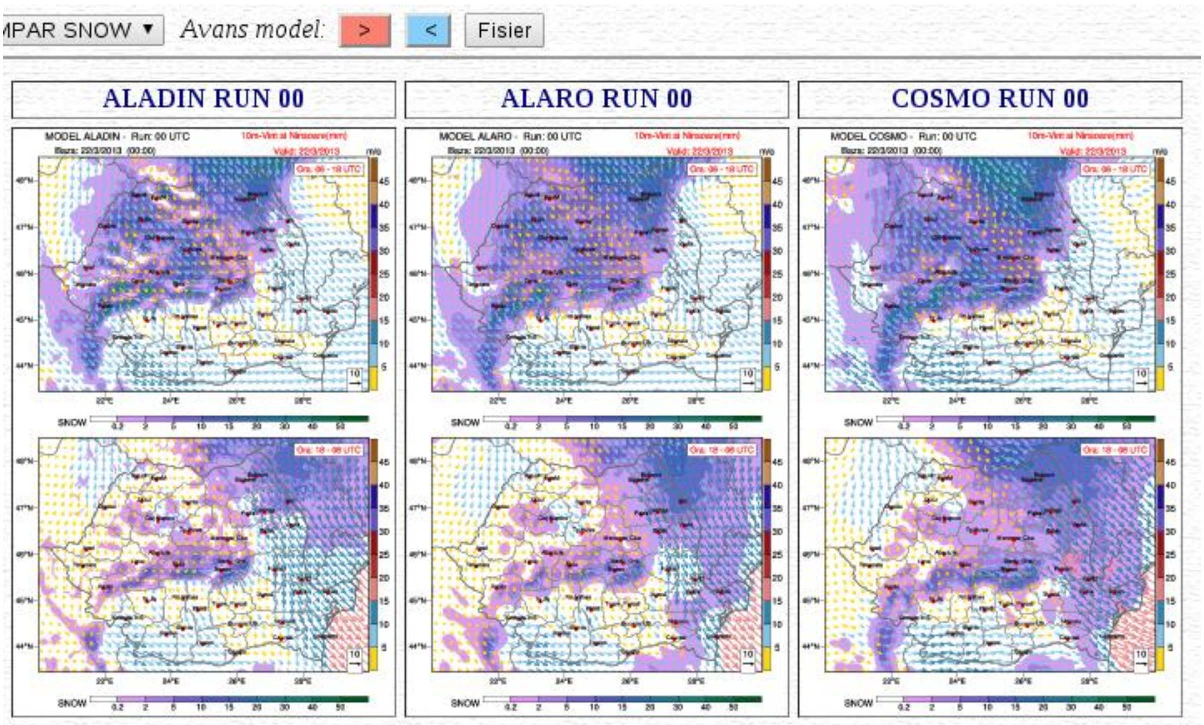
– **Starting January 2013, MOS_ALADIN model is being running for all the four RUNs: 00, 06, 12 and 18 UTC.** Products disseminated on the web are the same as until now. The statistical models have been updated and the model for discriminate analysis has been replaced with logistic regression for the forecast of total cloudiness by classes and of precipitation.

– **New procedures for displaying on the web the forecasting parameters within the numerical models specific to the winter season.**

The visualising system used at NMA allows displaying the results from just one model; a second model can be displayed comparatively using the bi-screen procedure. The application we have developed is an aid to the forecaster, supplying a comparative system of the forecasts yielded by the numerical models. A number of parameters from the numerical models available at NMA are plotted on one and the same area, using the same accumulation interval and the same colour range. Total precipitation was separated by snow and liquid precipitation respectively. For the precipitation falling as snow, the 10-m wind was superposed, thus facilitating the interpretation and forecast of the blizzard phenomenon.



Display of total precipitation distribution, of those in the form of snow and of those in the form of rain from the ECMWF model. Similarly, pressing the MODEL button chooses one of the five available models.



Comparative display of precipitation in the form of snow and of the 10-m wind resulted from the numerical models available at NMA.

2. Participation of the Romanian specialists in international projects or programs

- The international ALADIN project (Aire Limitée Adaptation dynamique Développement InterNational; http://www.cnrm.meteo.fr/aladin/)
- The international RC-LACE project (R egional C ooperation for Limited A rea modelling in Central Europe; http://www.rclace.eu/)
- The European FP7 project MACC (Monitoring Atmospheric Composition and Climate)
- SiAiR – "Satellite & in-situ Information for Advanced Air Quality Forecast Services" (ESA project 2014 – 2015)
- KENDA: "Km - Scale Ensemble - Based Data Assimilation" (2010 - present)
- "PT NWP Metetorological Test Suite" – project leader (2013 - 2014)
- SPRT: "Support Activities" (2012 - present)
- VERSUS 2: "Verification System Unified Survey 2" (2009 - present)

3. Organization of national and international scientific conferences

- The 24th ALADIN Annual Workshop & HIRLAM All Staff Meeting 2014, 7 – 11 April 2014, Bucharest, Romania
- The 15th COSMO General Meeting, Sibiu, Romania, 2 - 6 September 2013
- COSMO Training Course, Bucharest, Romania**,** 20 – 31 October 2014

4. Participation of the Romanian specialists in the international symposiums and conferences

- Annual EWGLAM / SRNWP Meetings (2011, 2012, 2013, 2014)
- Annual ALADIN Workshops and HIRLAM All Staff Meeting (2011, 2012, 2013,2014)
- "COSMO / CLM / ART Training-Seminar 2015", Langen, Germany, 23 – 31 March 2015 (as lecturers)
- "COSMO / CLM / ART User Seminar", Offenbach, Germany, 2 - 6 March 2015
- The 10th ELSEDIMA International Conference - „Environmental Legislation, Safety Engineering and Disaster Management", Cluj-Napoca, Romania, 18 - 19 September 2014
- "WG5/VERSUS tutorial" Bologna, Italy, 21 – 24 June 2014
- "The 16th COSMO General Meeting", Eretria, Greece, 8 - 12 September 2014
- "COSMO / CLM / ART User Seminar", Offenbach, Germany, 17 – 21 March 2014
- "COSMO / CLM / ART Training-Seminar 2014. Theory and Application", Langen, Germany, 17 - 22 February 2014 (as lecturers)
- "The 15th COSMO General Meeting", Sibiu, Romania, 2 - 6 September 2013
- "Training on COSMO Data Assimilation (DA)", Langen, Germany, 29 July – 9 August 2013 (as lecturers)
- "Capacity Building in the Regional Numerical Weather Prediction based on the COSMO Model", Langen, Germany, 15 - 26 July 2013 (as lecturers)
- OTEM 2013 - "6th Workshop for Optoelectronic Techniques for Environmental Monitoring", Timisoara, Romania, 11 - 13 June 2013
- "WG5/VERSUS tutorial", Rome, Italy, 8 – 10 May 2013
- "COSMO / CLM User Seminar", Offenbach, Germany, 5 - 7 March 2013
- "6th COSMO / CLM Training Course. Theory and Application", Langen, Germany, 18 – 22 February 2013 (as lecturers)
- "Training (in situ) on Regional Numerical Weather Prediction Based on the COSMO Model", Bandung, Indonesia, 5 – 9 Octobre 2012

- “The 14th COSMO General Meeting”, Lugano, Swizerland, 10 - 14 September 2012
- "Capacity Building in the Regional Numerical Weather Prediction based on the COSMO Model", Langen, Germany, 16 - 27 July 2012 (as lecturers)
- “WG5/VERSUS tutorial”, Ostia, Italy, 2 – 4 April 2012
- “COSMO/CLM User Seminar“, Offenbach, Germany, 6 - 8 March 2012
- “Fieldextra training support” , Bologna, Italy, 23 – 24 November 2011
- “The 13th COSMO General Meeting”, Rome, Italy, 5 - 9 September 2011
- "Capacity Building in Regional Numerical Weather Prediction based on HRM and COSMO Models”, Langen, Germany, 18 – 30 June 2011
- “Complex HPC Spring School 2011 – COST Action IC0805 – Open Network for High - Performance Computing on Complex Environment”, Amsterdam, Holland, 9 – 16 May 2011
- “COSMO User Seminar”, Langen, Germany, 1 – 3 March 2011
- “ECMWF Training Courses on Numerical Weather Prediction – Parameterization of Diabatic and Subgrid Processes”, ECMWF (European Centre for Medium-Range Weather Forecasts), Reading, UK, 31 March – 10 April 2014
- “ECMWF Training Courses on Introduction for new users/MARS”,ECMWF (European Centre for Medium-Range Weather Forecasts), Reading, UK, 3 - 7 March 2014
- “ECMWF Training Courses on Numerical Weather Prediction – Data assimilation and use of satellite data”, ECMWF (European Centre for Medium-Range Weather Forecasts), Reading, UK, 23 April – 2 May 2012
- “ECMWF Training Courses on Numerical Weather Prediction – Numerical Methods, Adiabatic Formulation of Models and Ocean Wave Forecasting”, ECMWF (European Centre for Medium-Range Weather Forecasts), Reading, UK, 28 March – 1 April 2011

5. Publications

Papers in reviewed journals

Barbu N, Cuculeanu V, Stefan S, 2014: Modeling the precipitation amounts dynamics for different time scales in Romania using multiple regression approach, Rom. J. Phys. 59, 1127

Dumitrache R, Velea L, Barbu C, Ibanescu I, Lupascu A, 2011: Preliminary results of COSMO model forecast for the Romanian territory case studies. Romanian Reports in Physics, Vol. 63, No.1

Wang, Y., M. Bellus, C. Wittmann, M. Steinheimer, F. Weidle, A. Kann, S. Ivatek-Sahdan, W. Tian, X. Ma, S. Tascu, E. Bazile, 2011: The Central European limited-area ensemble forecasting system: ALADIN-LAEF. Q. J. R. Meteorol. Soc. 137: 000-000. DOI:10.1002/qj.751

Wang, Y., S. Tascu, F. Weidle and K. Schmeisser, 2012: Evaluation of the added value of regional ensemble forecast on global ensemble forecast, (doi: 10.1175/WAF-D-11-00102.1)

CLIMATE

1. Research orientation

The climatological department integrates climate monitoring and the use of in-situ observations satellite products reanalysis data and the results of the regional climate models, so as to develop useful applications in various socio-economic fields, in the form of climatic products and services, adapted to the demands of the beneficiaries. The results of the research themes are turned to good account both in the form of publications and contributions in dedicated scientific events and through specific products (e.g. new sets of climatic indicators with an increased spatial and temporal resolution, under the conditions of present climate and in projections for future, covering areas of interest to the beneficiaries – hydrographic basins, Black Sea basin, agricultural areas; diagnostic and forecast climatic assessments at different time scales starting from the annual one to decade and century intervals, climate hazard risk maps).

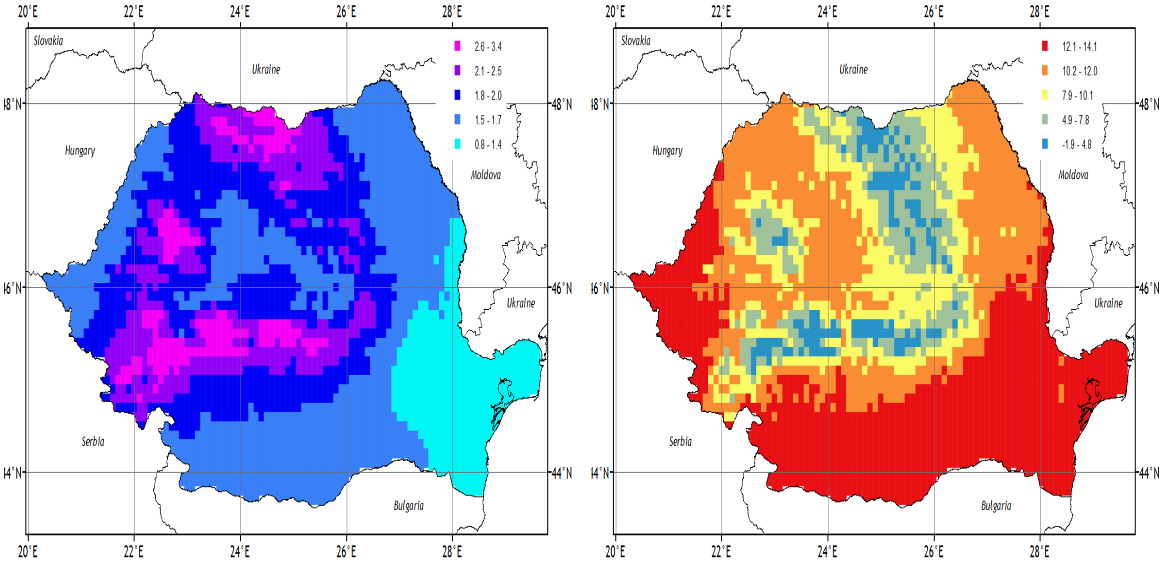
Researchers from the climatological department participated in the European projects EURO4M EU Research-Development FP 7) MASIMBRIS (Marie Curie Postdoctoral Reinsertion Fellowship, PEOPLE Program of the European Union), SEERISK (South East Europe Transnational Cooperation Programme) Euporias (a project within FP 7) and CC-WARE (South East Europe Transnational Cooperation Programme).

Within the FP7 EURO4M European project, Romanian researchers proceeded their activity of recovering historical data and achieving gridded products on the basis of essential climatic products as well as the analysis of in-situ observations, satellite data, reanalysis and model-yielded results, so as to contribute to the scientific substantiation of the climatic products and service demanded by a wide range of users.

The historical data recovery and digitization went on, so that a complete series was obtained for two more weather stations. On the grounds of data with long series, following data quality analysis and homogenization, daily gridded data were achieved at a 10-km resolution for the Romanian territory, covering the 1961-2013 interval for the following parameters: mean temperature, maximum temperature, minimum temperature, precipitation, sunshine duration, cloudiness, relative moisture and soil temperature.

Within the same FP 7 EURO4M project, a study was perform integrating in-situ and satellite data respectively, to characterize the shift indices in the summer season in Lunca Mureşului Natural Park which includes protected areas. The dynamics of the shift (increasing trend) in temperature is more enhanced during the day than during the night and more intense over the forest and urban area respectively than for the area with mixed vegetation or crops.

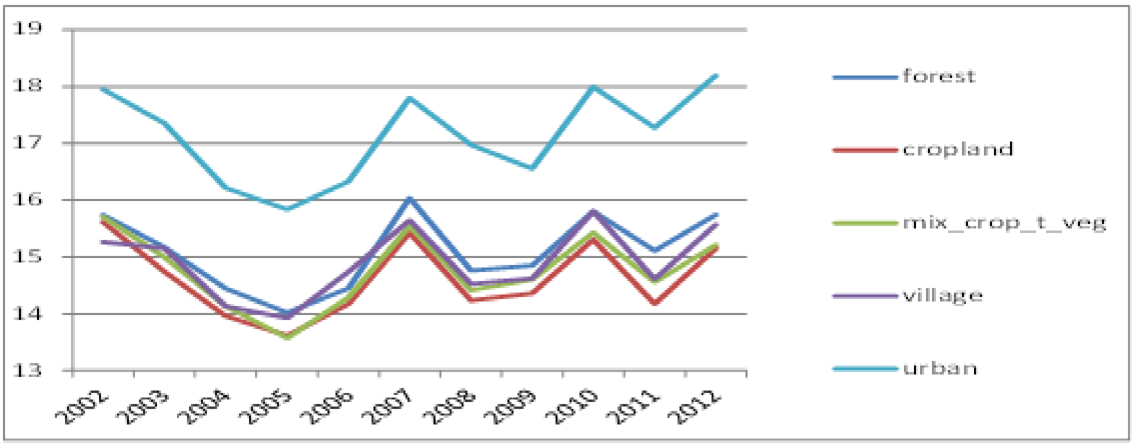
In view to substantiate the climatic products and services, there were analysed the climatic variability and change of the frequency of episodes with extreme wind in the Black Sea area, using satellite and in-situ data along with reanalyses and results from experiments with CLM regional climatic model (within the ENSEMBLES project) for the 1961-2000 and 2001-2040 intervals. The dynamic downscaling improves the regional description of the episodes with extreme wind over the Black Sea as compared to global reanalyses. According to data analysed so far, there is a decreasing trend as regards the frequency of episodes with extreme wind in the northern and central areas of the Black Sea, whereas an opposite trend emerges in some areas from the south of the Black Sea (fig. 3). The study also proceeded of certain indicators computed on the basis of climatic variables like the Palmer Drought Severity Index used in drought monitoring.



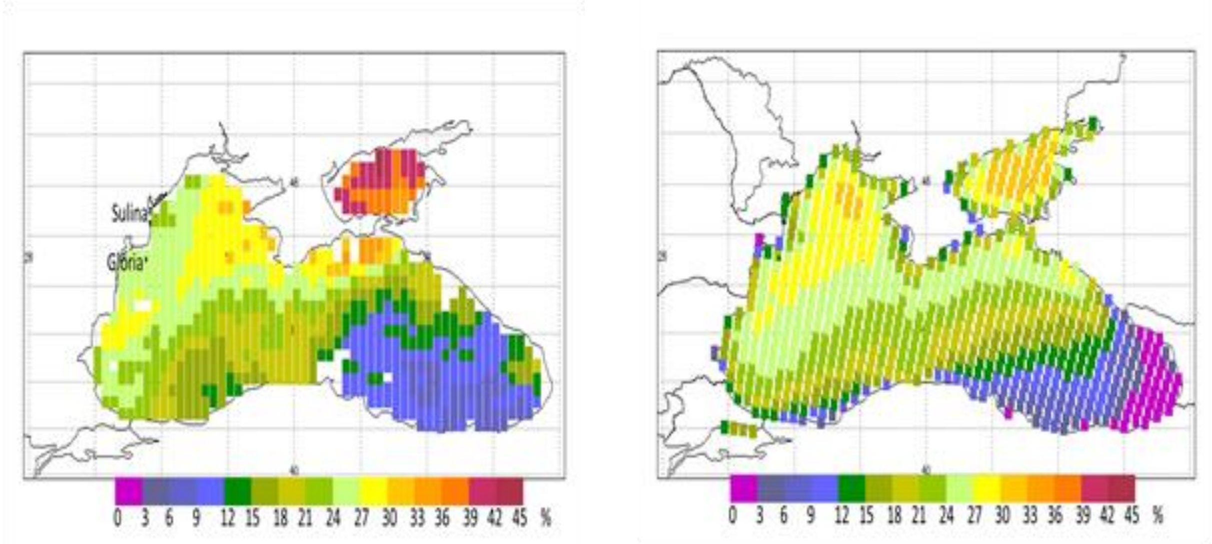
Examples of daily gridded product at a 10-km resolution: mean annual precipitation amount (mm/day) (left side figure) and mean annual soil temperature yielded from daily data (ºC) (right side figure) over 1961-2013.

Within MASIMBRIS project, an analysis was performed of the variability and change in the amount of precipitable water along the atmospheric column and of the water vapours content at the surface of the Black Sea using satellite products (MODIS, IASI), radiosounding data and reanalyses (ERA, Interim). The conclusion of the study was that sea surface air moisture data can be derived on the basis of the satellite products concerning the precipitable water in the atmospheric column.

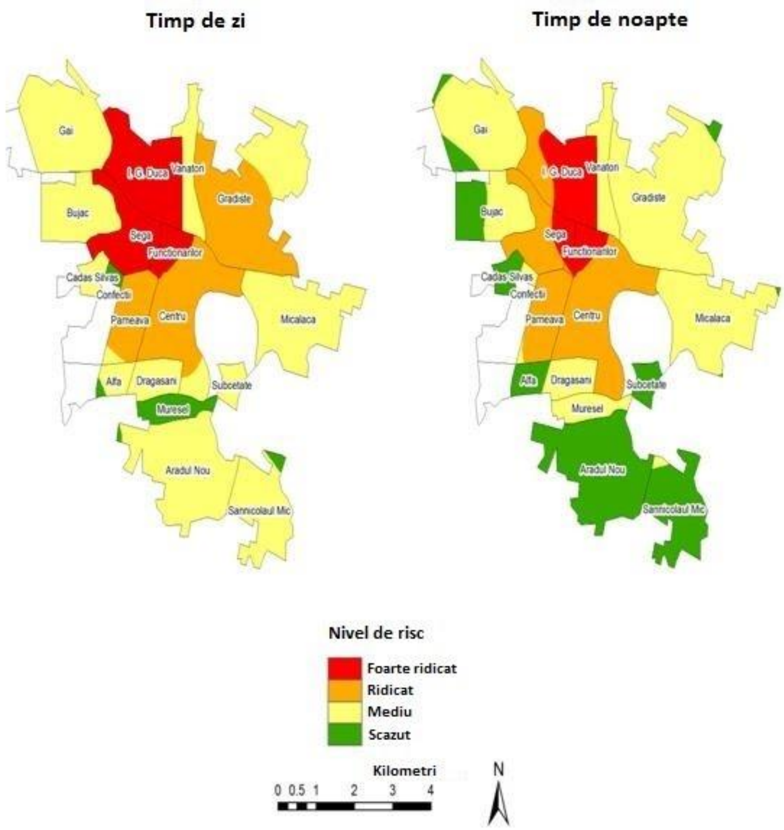
The main objective of the SEERISK project, with the participation of researchers from the climatological department (representing the National Meteorological Administration in the south-east European consortium) is to contribute to enhancing the regional coherence in evaluating the risk to natural hazards and to prepare for minimizing their effects at national and local level, especially in the case of risks generated by climate change in south-eastern Europe. The Arad Inspectorate for Emergency Situations is an associate partner in the project.



Temperature evolutions (ºC) of urban surfaces (dark blue), in crops (red), mixed vegetation and crops (light green), in village/commune-type localities (indigo) and in forests (dark blue) at night time. Surface temperature data are derived from the Aqua MODIS products and they cover the summer period (June-August) of the 2002-2012 interval.



Frequencies of wind episodes (as %) with speeds higher than 10 m/s in January obtained from QuickScat satellite data in 2001-2009 (left side figure) and from results of ERA-40 reanalyses downscaled with the ETHZ-CLM regional model in 1961-2000 (right side figure).



Map of the natural hazard level in the case of the heatwave risk in the area of Arad municipium. The natural hazard level was defined on the basis of the city’s heat island identified in satellite (Aqua MODIS) data of the surface temperature.

Within the CC-WARE project there were identified those climatic indicators representative for the evaluation of the vulnerability of the water resources and for the delimitation of climatically homogeneous areas on a regional scale, as well as spatio-temporal variability analyses for the droughts in Romania.

Romanian researchers contributed to the analysis of in-situ observations, satellite products and impact data for the area of Arad municipium, contributing to the heatwave risk maps. Researches also aimed to expand the methodology for other urban areas in Romania.

Within the EUPORIAS project, the main objective in 2013 was to select for designing purposes certain fully functional prototypes of climatic services adapted to specific user demands, at monthly and annual time scale respectively, with the possibility to expand to decade scale, as well as constructing the methodological frame for designing climatic services for extreme phenomena in Romania. A campaign of interviews was carried out with users of climatic information in view to elaborate climatic products and services adapted to beneficiary demands.

The main national projects with a participation of researchers from the Climatological Department were KARSTHIVES and CLIMHYDEX within PNCDI II. In the KARSTHIVES project the main objective targeted by researchers working in the Climatological Department was to supply a support for integrating meteorological measurements made at Peştera Urşilor, Cloşani, close to Peştera Muierii (Baia de Fier) and at Topolniţa with in-situ karst data, in view to perform paleoclimatic analyses. Meteorological monitoring was also performed for the four caves analysed within the Karsthives Project and data were collected and validated, so as to be further used in paleoclimatic analyses performed by speleologists.

Within the CLIMHYDEX project, the following objectives were met, as proposed for 2013: construction of meteorological data sets with fine/very fine spatio-temporal resolution, necessary for the improvement of the performance of hydrological models in simulating extreme events (high floods, hydrological droughts, understanding the large scale mechanisms that control the variability of climatic extremes in Romania at various time scales and developing improved statistical downscaling models for the estimation of local climatic extremes and of the input meteorological parameters used in hydrological models using large scale predictors.

As regards their own research themes, the researchers from the Climatological Department approached in 2013 (meeting objectives that aimed at ensuring meteorological monitoring and the methodological substantiation of the operational meteorology) were:

1. Substantiation of researches concerning the climate change in Romania and present-day magnitude of the global warming; natural and anthropic impact issues, adaptation and prevention methods;
2. Dynamic-statistical modeling of the evolution of the climatic system and improving the forecast of regional climatic anomalies with a long anticipation;
3. Estimations of regional climatic fluctuations bearing a great impact on precipitation generating maximum discharges in rivers in climate change circumstances.

Results obtained in 2013 represent solid ground for approaching the general direction consisting in the integration of a number of climatic information and data types for the development of climatic services and products. Results of the research activity obtained in 2013 were turned to good account through publishing scientific papers and elaborating climatic products and services. (an approach to be deepened in the forthcoming years).

2. Participation of the Romanian specialists in national and international projects/ programs

- Climate Archives in Karst – KARSTHIVES Project
- Changes in Climate Extremes and Associated Impact in Hydrological Events in Romania –

CLIMHYDEX Project
- European Reanalysis and Observations for Monitoring – EURO4M Project
- European Provision Of Regional Impacts Assessments on Seasonal and Decadal Timescales – EUPORIAS Project
- Evaluating the adaptive potential of the main coniferous species for a sustainable forest management in the context of climate change (GENCLIM), financed by the Executive Agency for Higher Education, Research, Development and Innovation Funding, grant number PN-II-PC-PCCA-2013-4-0695 (2014-2016)
- Joint Disaster Management risk assessment and preparedness in the Danube macro-region – SEERISK Project
- Mitigating Vulnerability of Water Resources under Climate Change – CCWARE Project
- Moisture at the Air-Sea Interface on the Mediterranean and Black Sea using IR Satellite data – MASIMBRIS Project

3. Organization of national and international scientific conferences

- National Criosfera Symposia (20-23 Februay 2013), Ploiesti, Romania.
- National Meteorological Administration Annual Scientific Conference, November 2013.
- International Conference of Ecological University of Bucharest, 4-5 April, 2013;

4. International workshops, conferences and symposiums (selection)

- MEDARE (MEditerranean climate DAta REscue) workshop (27-28.09.2012), Istanbul, Turkey;
- MedCOF Scoping Meeting (12-14.06.2013), Madrid, Spain;
- Cost Action ES1005 Tosca (2-4.09.2013, Prague, Czech Republic;
- European Geosciences Union General Assembly 2013 (8-12.04.2013), Vienna;
- Atmosphere and Cryosphere Assembly DACA-13 Air, Ice & Process Interactions (8-12.07.2013), Davos, Switzerland;
- EMS/ECAC Conference (10-14.09.2012), Łódź, Poland;
- EGU 2013 Conference (8-12.04.2013), Vienna, Austria;
- EMS/ECAM Conference (9-13.09.2013), Reading, UK;
- Summer School From Renewable Energy Production to End Users, (1-5.07.2013), Montegut, France;
- 2nd EURO4M USER WORKSHOP. 14-15 2013, Offenbach, Germany;
- Climate services providers and users' needs'- (14.03.2013- 15.03.2013), Utrecht, Netherlands;
- SEERISK Project Meeting (23.10.2013- 26.10.2013), Trnava, Slovakia;
- SEERISK Project Meeting (15.05.2013- 16.05.2013), Sarajevo, Bosnia and Hertzegovina;
- SEERISK Project Meeting (05.02.2013- 06.02.2013), Novi Sad, Serbia;
- EUPORIAS 2nd General Assembly. 1-4.10.2014, Norrköping, Sweden;
- EGU 2013 Conference (8-12.04.2013), Vienna, Austria;
- SEERISK Project Meeting (Nov 2014), Siofok, Hungary;
- SEERISK Project Meeting (Dec 2014), Budapest, Hungary.

5. Publications

Books

SEERISK (2014) Guideline on climate change adaptation and risk assessment in the Danube macro-region. Published by National Directorate General for Disaster Management, Hungary. Pages 77-87. ISBN 978-963-87837-5-2

Scientific papers in peer-reviewed journals

Bădescu V, Dumitrescu A (2013) Accuracy of CM-SAF solar irradiance incident on horizontal surface. *Theoretical and Applied Climatology*. DOI:10.1007/s00704-013-0990-1.

Bădescu V, Dumitrescu A (2013) The CMSAF hourly solar irradiance database (product CM54): Accuracy and bias corrections with illustrations for Romania (south-eastern Europe). *Journal of Atmospheric and Solar-Terrestrial Physics* 01/2013; 93:100 - 109.

Bădescu V, Gueymard C, Cheval S, Oprea C, Baciu M, Dumitrescu A, Iacobescu F, Miloş I, Rada C (2013) Accuracy analysis for fifty-four clear-sky solar radiation models using routine hourly global irradiance measurements in Romania. *Renewable Energy* 55:85-103

Bădescu V, Gueymard C, Cheval S, Oprea C, Baciu M, Dumitrescu A, Iacobescu F, Miloş I, Rada C (2013) Accuracy and sensitivity analysis for 54 models of computing hourly diffuse solar irradiation on clear sky. *Theoretical and Applied Climatology* 111(3-4):379-399

Barbu N, Georgescu F, Stefanescu V, Stefan S (2014): Large-scale mechanisms responsible for heat waves occurrence in Romania. Rom. J. Phys. 59: 1109

Birsan MV (2013) Application of a distributed physically-based hydrological model on the upper river basin of Somesul Mare (Northern Romania). Rom Rep Phys 65(4): 1469-1478.

Birsan MV, Dumitrescu A (2014) Snow variability in Romania in connection to large-scale atmospheric circulation. Int J Climatol 34: 134-144. DOI: 10.1002/joc.3671

Birsan MV, Dumitrescu A, Micu DM, Cheval S (2014) Changes in annual temperature extremes in the Carpathians since AD 1961. Nat Hazards 74(3): 1899-1910. DOI: 10.1007/s11069-014-1290-5

Birsan MV, Marin L, Dumitrescu A (2013) Seasonal changes in wind speed in Romania. Rom Rep Phys 65(4): 1479-1484

Birsan MV, Zaharia L, Chendes V, Branescu E (2012) Recent trends in streamflow in Romania (1976–2005). Rom Rep Phys 64(1): 275-280

Birsan MV, Zaharia L, Chendes V, Branescu E (2014) Seasonal trends in Romanian streamflow. Hydrol Process 28(15): 4496-4505. DOI: 10.1002/hyp.9961

Busuioc A, Dobrinescu A, Birsan MV, Dumitrescu A, Orzan A (2014) Spatial and temporal variability of climate extremes in Romania and associated large-scale mechanisms. Int J Climatol. DOI: 10.1002/joc.4054

Cheval S, Birsan MV, Dumitrescu A (2014) Climate variability in the Carpathian Mountains Region over 1961–2010. Global Planet Change 118: 85-96. DOI: 10.1016/j.gloplacha.2014.04.005

Cheval S, Busuioc A, Dumitrescu A, Birsan MV (2014) Spatiotemporal variability of meteorological drought in Romania using the standardized precipitation index (SPI). Clim Res 60:235-248. DOI: 10.3354/cr01245

Dima M, Lohmann G, Rimbu N (2014): Possible North Atlantic origin for the changes in ENSO properties during the 1970s, Climate Dynamics, DOI 10.1007/s00382-014-2173-x

Dumitrescu A, Bojariu R, Birsan MV, Marin L, Manea A (2014) Recent climatic changes in Romania from observational data (1961-2013). Theor Appl Climatol. DOI: 10.1007/s00704-014-1290-0

Ianovici N, Birsan MV, Tudorica D, Balita A (2013) Fagales pollen in the atmosphere of Timisoara,

Romania (2000-2007). *Annals of West University of Timisoara, Series of Biology* 2: 115-134.
Ionita M, Chelcea S, Rimbu N, Adler MJ (2014): Spatial and temporal variability of winter streamflow over Romania and its relationship to large-scale atmospheric circulation, Journal of Hydrology. doi:10.1016/j.jhydrol.2014.09.024.
Ionita M, Dima M, Lohmann G, Scholz P, Rimbu N (2014): Predicting the June 2013 European Flooding based on Precipitation, Soil Moisture and Sea Level Pressure, Journal of Hydrometeorology. Doi: http://dx.doi.org/10.1175/JHM-D-14-0156.1
Marin L, Birsan MV, Bojariu R, Dumitrescu A, Micu DM, Manea A (2014) An overview of annual climatic changes in Romania: trends in air temperature, precipitation, sunshine hours, cloud cover, relative humidity and wind speed during the 1961–2013 period. Carpath J Earth Env 9(4): 253-258.
Rimbu N, Lohmann G, Ionita M (2014): Interannual to multidecadal Euro-Atlantic blocking variability during winter and its relationship with extreme low temperatures in Europe, Journal of Geophysical Research, DOI: 10.1002/2014JD021983.
Rimbu N, Lohmann G, Konig-Langlo G, Necula C, Ionita M (2014): Daily to intraseasonal oscillations at Antarctic research station Neumayer, ANTARCTIC SCIENCE, Volume: 26, Issue: 2, Pages: 193-204, DOI: 10.1017/S0954102013000540
Rimbu N, Stefan S, Necula C (2014): The variability of winter high temperature extremes in Romania and its relationship with large-scale atmospheric circulation TAAC DOI: 10.1007/s00704-014-1219-7.
Rimbu N, Stefan S, Necula C (2014)**:** The variability of winter high temperature extremes in Romania and its relationship with large-scale atmospheric circulation. *Theoretical and Applied Climatology*, DOI:10.1007/s00704-014-1219-7
Stefanescu V, Stefan S, Georgescu F (2014): Spatial distribution of heavy precipitation events in Romania between 1980 and 2009. Meteorol. Appl. 21: 684–694.
Velea L, Bojariu R, Cica R (2014): Occurrence of Extreme Winds Over the Black Sea During January Under Present and Near Future Climate. Turk J Fish Aquat Sci 14: 1-2. DOI: 10.4194/1303-2712-v14_4_17

ATMOSPHERIC PHYSICS

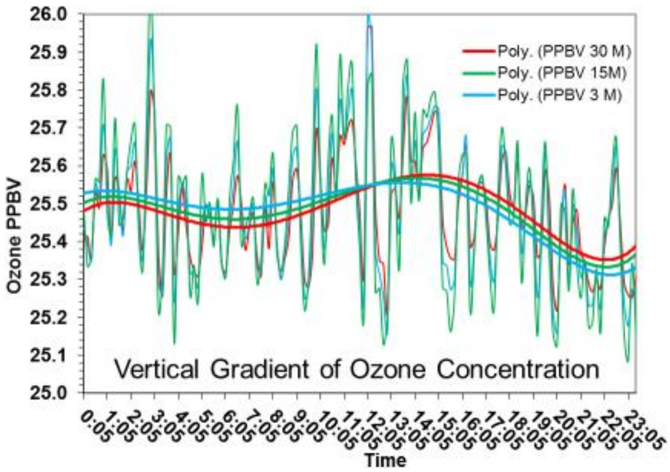
1. Research orientation

In the last years our activity were focused in 4 main fields:

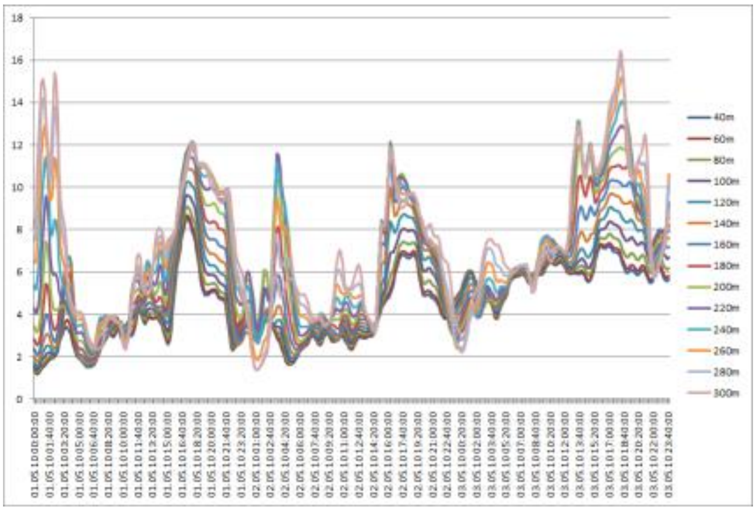
1.1 Boundary Layer measurements

Vertical profile of some air pollutants concentrations (Ozone, Nitrogen oxides, Sulphur dioxide, methane, NMHC) in laminar or turbulent boundary layer are investigated.

The measurements are carried out using a dedicated infrastructure consisting of a 30m mast to supports 3 PTFE high flow air lines covering 3 to 30m altitude and a temperature controlled container to host the gas analyzers. A sodar is used to get the 3D wind and turbulence profiles.



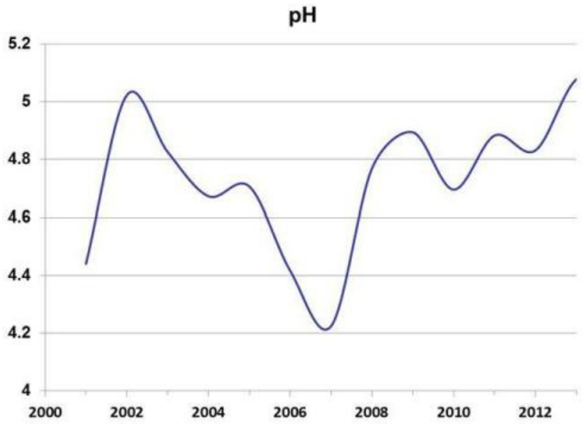
Smoothed vertical gradient of ozone concentration over 24H reversed at noon



Wind flow: laminar to turbulent transitions during 24H interval

1.2 GAW measurements

We are operating the Fundata GAW station with a very tight budget. Ozone, Satzman NO2 and pH are the only monitored parameters we can afford. Originally for pH each particular rain/snow event is measured. Data trend are closed to economic evolution of the construction sector (cement production).



1.3 Laboratory Instruments and analytic techniques experiments

An original multichannel analyser for atmospheric gamma radiation were build and is now tested. Good correlation for gamma radiation counts and atmospheric conditions were observed. Continuous spectral measurements of gamma nuclides in atmosphere are to be carried out with this instrument.

1.4 Theoretical studies

Ozone and oxidation mechanisms in the troposphere are the most studied issues in the lab, designing a Bucharest dedicated smog atmospheric model is a long term desideratum.

1.5 Solar radiation - activities and scientific preoccupations - 2011-2014

Solar radiation is the main energy source of the meteo-climatic processes. It is therefore very important to know its different aspects and interactions at atmospheric level. A first, most important aspect in knowing and understanding solar radiation is the measurement activity.

In NMA this takes place within a network of 36 automatic radiometric stations. The network was initially made up of 8 stations. They began to function effectively and yield data in 2006. Gradually it has grown through the establishment of new stations, reaching the current 36 locations.

The existing stations pyranometer-type are installed sensors for measuring global and diffuse solar radiation, CM6B, and netradiometer type NR LITE Kipp & Zonen- manufactured at 8 stations. The remaining measurement points are equipped with a photocell sensor type - QMN-101 for measuring global solar radiation. The shading for diffuse radiation is a system equipped with a shading ring type CM121B.

Compared to the surface, in Romania there are a satisfactory number of radiometric stations. Given that Romania's relief is varied in terms of altitude, and the altitude is one that imposes a significant vertical variation of the solar radiation, much more important than latitude, altitude layout stages stations may be considered as unsatisfactory. Most stations, 29 of them, are located at altitudes of less than 500m, 12 stations of which are located at less than 100m. For altitudes above 500m, where the vertical gradient of the solar radiation begins to be felt, there are only 7 stations and only one at over 1000m. Stations which measure diffuse radiation and net radiation are located at altitudes of up to 400m.

The material resulted from measurements is validated and statistically processed for needs related to scientific research in the field and the use of solar radiation as an unconventional energy source.

Besides the old concerns about radiation intercomparison data from measurements made in the automatic and direct reading instruments system, now disbanded, in recent years have placed particular emphasis on the study of the climatology of the solar radiation and its use in developing maps with the distribution of the monthly and annual global solar radiation in Romania.

These maps, together with tables and graphs are basic to the development of a solar radiation Atlas of Romania. Currently this atlas is only available in electronic format.

In the research activity, the team has worked with solar radiation scientific departments; especially the NMA Climatological Laboratory and the Polytechnic University of Bucharest (see scientific papers).

In the field of *radiometry* a comparative study was elaborated of the diffuse and global radiation for the radiometric stations performing classical and automatic measurements.

The *diffuse solar radiation (D)* is a belonging part of the *global solar radiation (Q).* The optical status of the atmosphere, mostly the cloudiness, makes the diffusion percent differ within the global solar radiation.

The Q/D ratio value in clear sky situations varies from 20 to 24 % in the afternoon hours, increasing in the winter season months to over 30%.

The small values of the Q/D ratio are mainly owed to the absence of clouds where molecular diffusion exists and the Q/D nb ratio values increase towards sunrise or sunset, reaching even 50%.

In the completely overcast sky cases, the values of the ratio double or even triple compared to those recorded in clear sky conditions. This can be explained through the presence of clouds that can be strongly diffusive, as are the cumulus-type ones in their different varieties or the cirrus-type clouds.

Within the E-AMDAR (the Aircraft Meteorological Data Relay of Europe) program modern commercial aircraft perform 4-6 daily vertical profiles of the temperature, moisture and wind at “Henry Coandă” airport in Otopeni, thus completing the main data source – the classical radio soundings from the standard terms $00^{\underline{00}}$ and $12^{\underline{00}}$ UTC.

AMDAR data mainly consist in meteorological observations performed by the instruments onboard the aircraft and they are obtained in two forms:

- on route (at flight level) and
- detailed vertical profiles (ASC or DES, at takeoff or landing).

Both the AMDAR data from Bucharest and those produced at the main European airports reach the National Meteorological Administration in two ways:

- through the Global Telecommunications System and
- on the Internet, through accessing the E-AMDAR portal.

Observations performed within AMDAR program are mainly used in the weather forecasting numerical models, after applying the assimilation procedure, in the local weather forecasting, in nowcasting and aeronautics, as well as in a wide range of operational meteorological applications. Those observations are considered an essential additional source for knowing and describing the initial state of the atmosphere.

In local weather forecasting, nowcasting and aeronautics, AMDAR data are generally used in the following areas of interest:

– warnings for strong wind;
– low-level windshear;
– intensity of the low-level inversions;
– determination of cloud height and fog dissipation duration;

– determination of precipitation type in wintertime;

– forecasting convective clouds formation;

– localizing wind effects (sea and lake breezes, slope wind in mountain areas etc.).

Within the theme developed in 2013, a set of applications was elaborated aiming to use the AMDAR data in the local weather forecasting for Bucharest. This contains the preparing applications necessary to this activity, consisting mainly in extraction, decoding and quality control of the AMDAR data, activities performed at "Henri Coandă" airport in Otopeni.

There were also elaborated two operational applications which yielded two upper air diagrams graphically rendering the vertical structures of certain meteorological parameters, as well as the values of certain derived parameters necessary to the analysis of the present-time state of the atmosphere. The following are thus represented on a diagram:

- air temperature comparative vertical structures obtained through radio sounding and the AMDAR program;
- air mass instability indicators;
- comparative vertical structures of: relative moisture, specific moisture, wind direction and speed.

Thus, two to four classical radio and/or AMDAR soundings may be rendered on the diagram, function of the performing duration of those soundings during the day.

Spatial and temporal characteristics of the urban canopy layer heat island (UCLHI) of Bucharest, Romania, was studied for the wintertime by including ArcGIS interpolated values of temperature in the standard series of air temperature values, measured at meteorological stations in Bucharest and its surroundings.

The period of study covered the months of December, January and February of the years 2008 and 2009. For each month of the analyzed period, the magnitude of the Bucharest CLHI reached its maximum value between the hours 00-03 and 21-24 of the day. Its global maximum value was of 1.56ºC, recorded in December 2008, in the 3-hour interval 21-24, while its global minimum value was of 0.31 ºC, in February 2008, in the 3-hour interval 00 – 03.

The seasonal and diurnal variations of the Bucharest UCLHI was also studied by plotting the isopleths of urban-rural temperature differences between hourly measured temperatures at the meteorological stations Bucharest-Filaret (urban), and Bucharest-Baneasa (considered as rural) for the year 2009. The temperature differences were considered for each hour and averaged over each month of 2009. Their plot clearly exhibits the seasonal and diurnal patterns of the Bucharest CLHI for the chosen period of time.

The planetary boundary layer height is a key parameter in controlling the near-surface air pollutant concentrations. The determination of this parameter from lidar backscatter lidar profiles was studied by fitting techniques. A computer code of a multidimensional minimization algorithm, which fits a 4-parameter idealized backscatter profile to a synthetic lidar backscatter ratio profile similar to those measured by aircraft-borne down looking lidars, was provided.

The issue of the *atmospheric ozone* is a priority in the environmental researches because of the negative consequences of the ozone amount decrease. Within this issue, continuously monitoring and researching the state and evolution of the ozone layer is a greatly important activity, coordinated by the World Meteorological Organization through GAW "Global Atmosphere Watch" which Romania has also joined through measurements and researches of the total ozone. The daily transmission of the total ozone measurements to the world data collection center in Canada contributes to building an important observations fund necessary for establishing the long term variation trend of the ozone and for the real time elaboration of the total ozone maps at the level of the Northern Hemisphere.

2. Participation to domestic and international scientific conferences and symposia

D. Dobrovolschi, V. Ristici, Anca Ristici, Rodica Sandu, C. Rada, 2011: Lidar backscatter profiles fitted by multidimensional minimization, 5th Workshop on Optoelectronic Techniques for Environmental Monitoring, 28-30 September 2011, Magurele, 21pp.

Adela Bonciu, D. Dobrovolschi, 2011: Contributions to identifying and analyzing the urban heat island of Bucharest city during the winter by using GIS techniques, Annual Scientific Session of the Romanian National Meteorological Administration, 17-18 November 2011 Bucharest, 13 pp. (in Romanian)

3. Scientific papers in peer-reviewed journals

Badescu V, Guemard C.A., Cheval S, Oprea C, Baciu M, Dumitrescu A, Iacobescu F, Milos I, Rada C, 2013: Accuracy and sensitivity analysis models for fifty-four hourly diffuse solar irradiation of computing on clear sky, Applied Climatology , Volume 111, Issue 3-4, pp. 379-399

Cuculeanu V, Ungureanu I, Stefan S, 2013: Study on the Relationship Among Radiative Forcing, Albedo and Cover Fraction of the clouds. Romanian Journal of Physics, Vol. 58, no. 7-8, pp. 987-997

Labzovskii L, Toanca F, Stefan S, 2014: Determination of Saharan dust properties over Bucharest, Romania. Part 1: procedures and algorithms. Rom. J. Phys. 59, 1084

Manea A, Oprea C, 2011: Classical and automatic measurement of solar radiation; preliminary result, Romanian Journal of Climatology, Volume II, pp. 78-83

Mihailov M.E., Buga L., Malciu V., Sarbu G., Oros A., Lazar L., Stefan S, 2013: Characteristics of upwelling, algae bloom and hypoxia events on the Western Black Sea in 2010, Fresenius Environmental Bulletin, acceptat spre publicare în Vol. 22; No. 10

Rada C., 2012: The influence of stratospheric dynamics on total ozone – case study. Romanian Reports in Physics, Vol. 64, no. 2

Sokół P, Iwona S. Stachlewska, Ioana Ungureanu, Sabina Stefan, 2014: Evaluation of the Boundary Layer Morning transition using the CL-31 Ceilometer Signals. Acta Geophysica**,** vol. 62, no. 2, pp. 368-381. DOI: 10.2478/s11600-013-0158-5.

Stefan S, Radu C, Belegante L, 2013: Analysis of air quality in two sites with different local conditions. Environmental Engineering and Management Journal, Vol. 12, No. 2, 381-392

Stefan S, Ungureanu I, Grigoras C, 2014: A survey of cloud cover over Magurele, Romania, using ceilometer and satellite data. Romanian Reports in Physics, vol. 66, No. 3

Stefan S, Zagar L, Necula C, Barladeanu R, Rada C, 2014: Assessment of surface-ozone in bucharest, romania focused on trends for three years. Environmental Engineering and Management Journal, Volume: 13, Issue: 2, Pages: 241-250

Vâjâiac S., V. Filip, S. Ştefan, 2014: Assessing the size distribution of droplets in a cloud chamber from light extinction data during a transient regime. Journal of Atmospheric and Solar-Terrestrial Physics 109C, pp. 29-36, DOI: 10.1016/j.jastp.2014.12.018.

AGROMETEOROLOGY

1. Research orientation

The main purpose of Agromonitoring Network is continuous surveillance of the agrometeorological phenomena (thermal, hydric and mechanic stress/risk) in order to identify in real time the most vulnerable areas and the dissemination of information towards the users aiming at making the right decision to prevent and mitigate the effects upon the crop efficiency.

Romanian agro-meteorological observations network is formed from 55 stations, where meteorological data are collected daily automatically in 39 and with classical instruments in 16 stations. Soil moisture is measured with portable probes every decade and plant related observations are performed weekly, the reports containing detailed information about crop vegetation stage, damages provoked by extreme meteorological events (droughts, heat waves, hail, storms, strong winds, frost, etc.), and soil status within each crop of interest (moisture, friability, cracks, etc.). The agro-meteorological stations are considered representative for the entire agricultural land of the country, those information received from all stations was used to map the spatial distribution of precipitation and to delineate the regions affected by different drought and heat wave intensities.

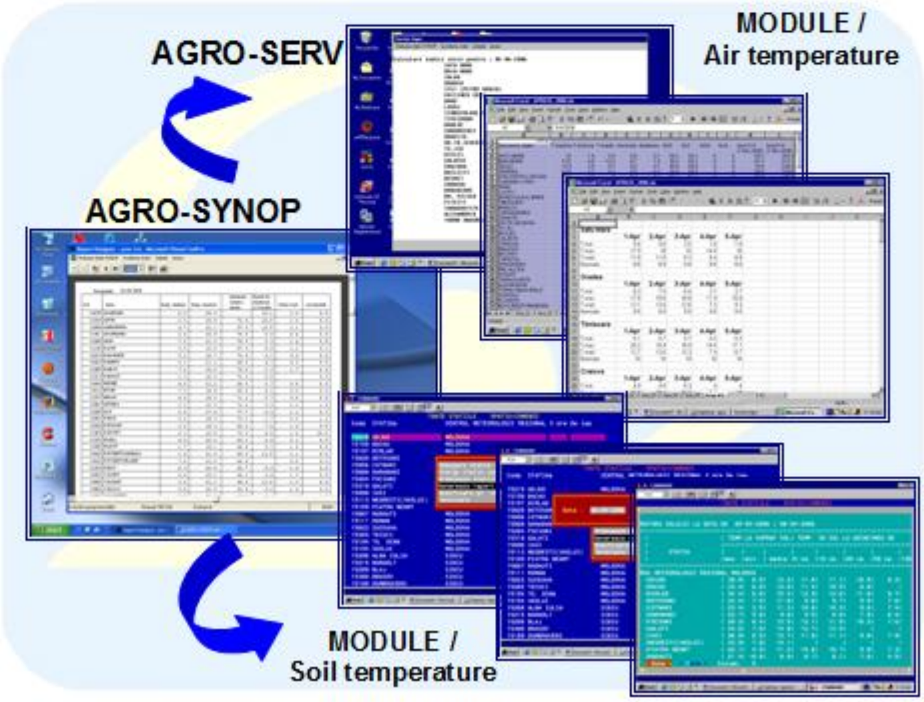
Soil water balance is directly affected by the crop water requirement through evapotranspiration, which is dependent mainly on temperature and stage of vegetation. Crop water requirements depend on local weather conditions, soil and plants' characteristics and plant stage of growth. Agricultural or pedological drought occurs when root-zone soil moisture is insufficient to sustain crops between rainfall events.

The meteorological and agrometeorological information is classified function of agricultural regions of reference and types of crops, validated and managed on the basis of informational programmes devided into modules according to data structures representing the whole Agrometeorological Monitoring System.

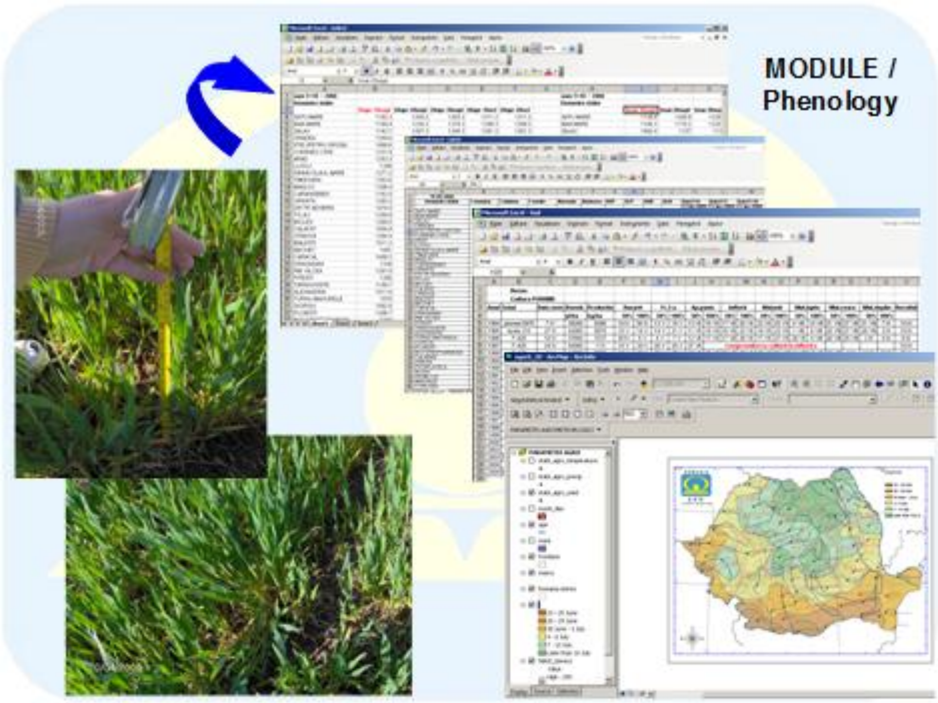
Objectives and tasks:

- to monitor daily agrometeorological parameters and changes in the soil moisture content at the crop level;
- to identify periods and agricultural areas seriously affected by extreme events;
- to carry out long-term agrometeorological forecasts upon plant growth, development and efficiency;
- to project and diversify the agrometeorological products in order to improve the quality of the specialized agrometeorological services and the scientific-based assistance of the decision-making factors in the agricultural domain;
- to improve the capacity of dissemination and turn to good account the specialized agrometeorological information at national, regional and local level through state-of-the-art technological transmission and transfer equipment.

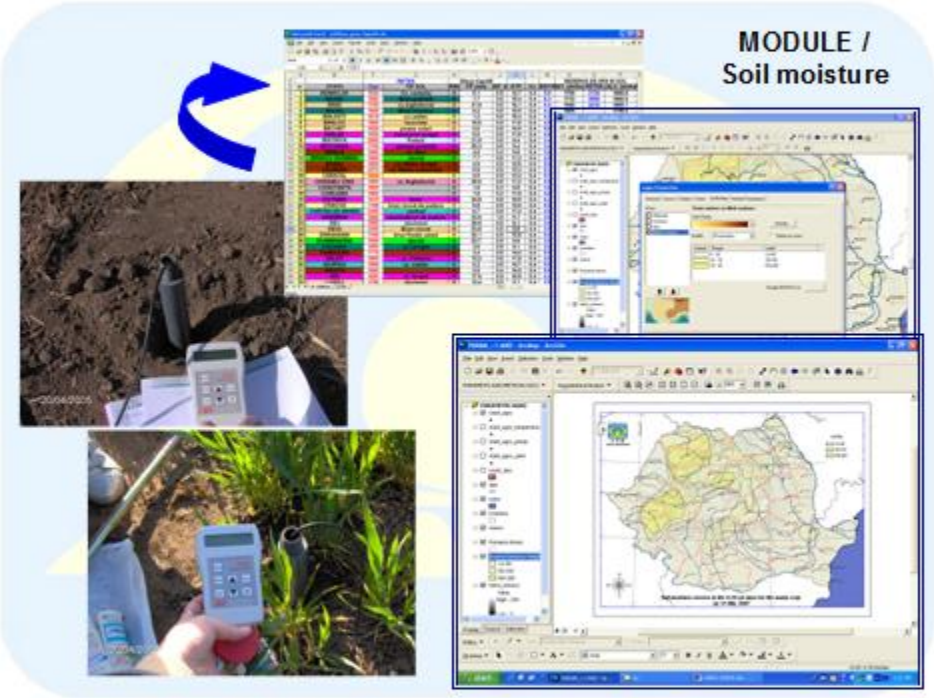
The meteorological data (from synoptic meteorological database/ORACLE) processing and interpretation are made using specific applications, such as AGRO-SYNOP, AGROSERV and AGRO-TEMPSOL. The agrometeorological data represent specialized information coming from the network’s weather stations with agrometeorological programme, representative for areas of agricultural interest in Romania.



AGRO-SERV and AGRO-SYNOP modules



Phenology module



Soil moisture module

2. Participation in national and international projects/ programs

2.1 National projects:

- **ADER 1.1.1 Project:** Geo-referenced system indicators at different spatial and temporal scales for the assessment of vulnerability and adaptation measures, 2011-2014
- **Proiect ADER 3.3.1:** System of inventory, monitoring and evaluation indicators on the agreement with the European directives specific of agri-environment semi-subsistence farms, 2011-2014
- **Proiect ADER 5.1.1:** Creating geo-referenced database on regional climate risks for major crops, horticultural and domestic animal species, 2011-2014
- **Proiect ADER 8.1.1:** Risk assessment on mycotoxin contamination annual production of wheat in Romania, 2011-2014
- **Proiect ADER 1.1.13:** Zoning varieties of species of fruit rootstocks and varieties basins, depending on climatic and socio-economic conditions, 2013-2014

2.2 International projects:

- INTERREG IVC/ WATERCoRe Project: Water scarcity and drought - Co-ordinated activities in European Regions", 2010-2013 (http://www.watercore.eu)
- ORIENTGATE project ORIENTGATE - A structured network for integration of climate knowledge into policy and territorial planning", 2012-2014. (http://www.orientgateproject.org).

3. Publications

3.1. Books:

Sandu I, Mateescu E, Vatamanu VV(2010) – *"Schimbari climatice in Romania si efectele asupra agriculturii"*, Editura SITECH Craiova, ISBN 978-606-11-0758-2, 392 pp. (in romanian)

Chitu E, Mateescu E, Petcu A, Surdu I, Sumedrea D, Tanasescu N, Paltineanu C, Chitu V, Mladin P, Coman M, Butac M, Gubandru V (2010) – *„Modele de estimare a favorabilitatii climatice pentru cultura pomilor in Romania"*, Editura INVEL Multimedia Bucuresti, ISBN 978-973-1886-52-7, 132 pp. (in romanian)

Gagiu V, Mateescu E, Belc N (2013) – *„Evaluarea riscului privind contaminarea cu micotoxina deoxinivalenol a recoltei de grâu din România, anul 2012",* Editura Printech, ISBN 978-606-23-0053-1, 149 pp. (in romanian)

Gagiu V, Cucu M, Dobre A, Mateescu E, Oprea O, Belc N (2014) – *„Contaminarea cu micotoxina deoxinivalenol a recoltei de grâne a anului agricol 2013-2014",* București -2014, ISBN 978-973-0-18158-6, 113 pp. (in romanian)

Mateescu E *et al.* (2014) – *„Cod de bune practici agricole, în contextul schimbărilor climatice actuale și previzibile"*, București - 2014, ISBN 978-973-0-17948-4, 171 pp. (in romanian)

Mateescu E *et al.* (2014) – *„Adaptation measures in Romanian agriculture"*, Bucharest-2014, ISBN 978-973-0-17760-2, 95 pp.

Coman M, Chitu E, Toti M, Dumitru S.I., Mateescu E, Zagari I, Septar L, Sirbu S, Preda S.A., Petre G, Rățoi I, Hârșan E, Petrișor C, Călinoiu I (2014) – *„Zonarea speciilor pomicole în funcție de condițiile pedoclimatice și socioeconomice ale României"*, Editura Invel Multimedia - 2014, ISBN 978-973-1886-86-2, 267 pp. (in romanian)

3.2 Scientific papers in peer-reviewed journals:

Bojariu R, Velea L, Mateescu E, Cica R.D., Alexandru D, Dobrinescu A.E, Birsan M, Dumitrescu A (2012) – *Local climate mechanisms related to aridization of Oltenia Plain*, Analele Universității din Craiova, seria Agricultură – Montanologie – Cadastru (Annals of the University of Craiova – Agriculture, Montanology, Cadastre Series) Vol. XLII-2012/1, pp. 79-84.

Chitu E, Giosanu D, Mateescu E (2013) – *Seasonal and Annual Extreme Temperature Variability and Trends of the last three decades in Romania,* Advances in Environmental Sciences - International Journal of the Bioflux Society, Online ISSN 2065-7647. Volume 5, Issue 2: 70-88; http://www.aes.bioflux.com.ro;

Mateescu E (2013) – *Protecting agriculture in Romania*, Publication "Climate change adaptation practice across the EU-Understanding the challenges and ways forward in the context of multi-level governance", published by Milieu Ltd. (Belgium) and EU-DG Climate Action, Project number: 2013.7806, ISBN 978-92-79-33765-9 DOI 10.2834/59739

Paltineanu C, Chitu E, Mateescu E (2011) – *Changes in crop evapotranspiration and irrigation water requirements*, International Agrophysics, Polish Academy of Sciences, *2011, 25, 369-373;*

Paltineanu C, Chitu E, Mateescu E (2012) – *New trends for reference evapotranspiration and climatic water deficit*, International Agrophysics, Polish Academy of Sciences, *2012, 26, 159-165,* doi: 10.2478/v 10247-012-0023-9

Potop V., Mateescu E., Türkott L., Zahradníček P., Boroneanţ C., Constantinescu F., Iamandei M. (2014b) - *Application of DSSAT model to simulated thermophilic crops in central and southern Europe*. In: Rožnovský, J., Litschmann, T., (eds): Mendel a bioklimatologie. Brno, 3–5.9.2014, ISBN 978-80-210-6983-1 (CD)

3.3 Proceedings of National and International Conferences:

Mateescu E, Stancalie G *et al.* (2012) – *Drought Monitoring in Romania*, Proceedings of theJoint Workshop JRC/DMCSEE/Biotechnical faculty/ "Different approaches to drought monitoring – towards EuroGEOSS interoperability model", Ljubljana, *23rd – 25th November 2011, "*Towards EuroGEOSS interoperability model in drought monitoring in SEE region", ISBN 978-961-6275-43-9, 16-27 pp

Stancalie G, Mateescu E *et al.* (2012) – *MIDMURES Project - Mitigation Drought in Vulnerable Area of the Mures Basin*, Proceedings of theJoint Workshop JRC/DMCSEE/Biotechnical faculty/ "Different approaches to drought monitoring – towards EuroGEOSS interoperability model", Ljubljana, *23rd – 25th November 2011, "*Towards EuroGEOSS interoperability model in drought monitoring in SEE region", ISBN 978-961-6275-43-9, 28-40 pp

Blaj V.A., Marușca T., Mocanu V., Haș E.C., Mateescu E. (2013) - *Long term influence of methods to improve subalpine Nardusstricta l. grasslands in the Carpathian Mountains, Pastoralism and ecosystem conservation* Proceedings of the 17th Meeting of the FAO-CIHEAM Mountain Pasture Network, 5-7 June 2013, Trivero, Italy, ISBN 978-88-908636-2-2, pg. 140-144

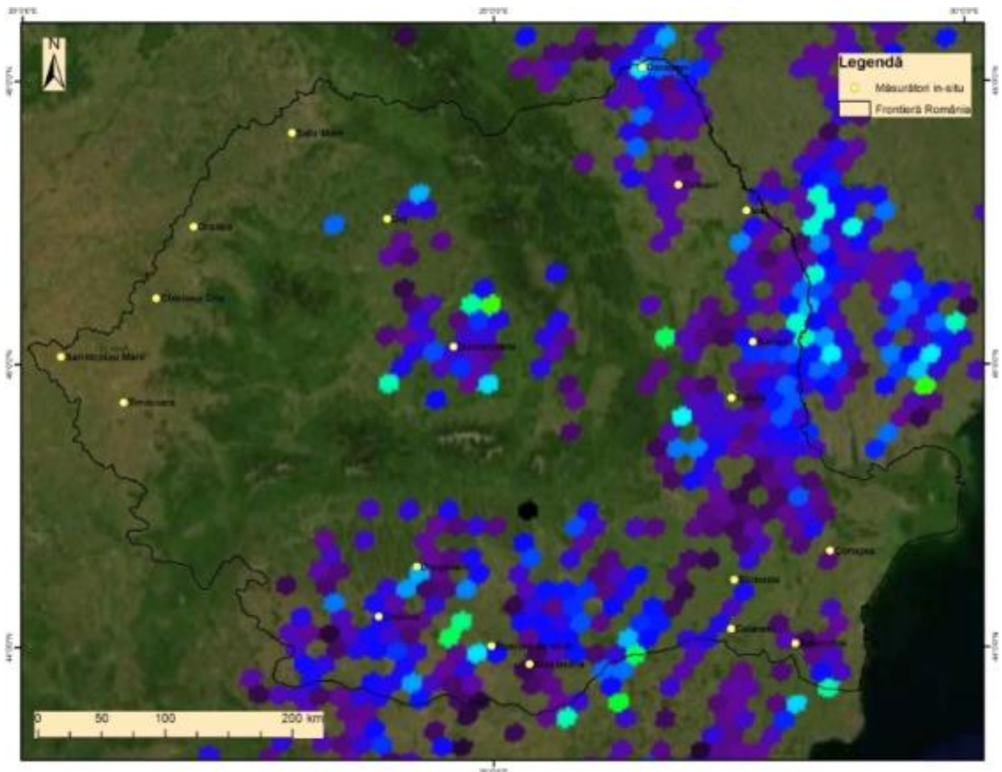
REMOTE SENSING AND GIS RELATED ACTIVITIES

1. Research orientation

The operative and research activities carried out within the Remote Sensing and Geographic Information Systems Laboratory are briefly presented herein. Research was carried out in various tasks and projects, involving, for instance, spatial data infrastructures for meteorological applications, assessment of moisture products derived from satellite data, or operational service aimed at supplying quantitative measurements of the terrestrial cover with snow and ice.

Regarding the spatial data infrastructure, the research aims at initiating and developing an interoperable work frame for the management of meteorological information meant to contribute to the achievement of a national infrastructure of spatial data, in conformity with the provisions of the European initiatives in the field. The activities listed below were performed:

- Analysis of the INSPIRE compatible standards for publishing and supplying geospatial services through web services (Web Map Service, Web Feature Service, Web Coverage, Catalogue Service);
- Evaluation of the methods for representing vector data using the SLD (Styled Layer Descriptor) standard.
- Activity proceeded for developing an online INSPIRE-compatible system based on open source applications named GEOMET, meant to allow the management of meteorological data in a geospatial context.



SMOS (ESA) Satellite – L2 Product: Soil Moisture, 30 April 2013 16:25 hrs.

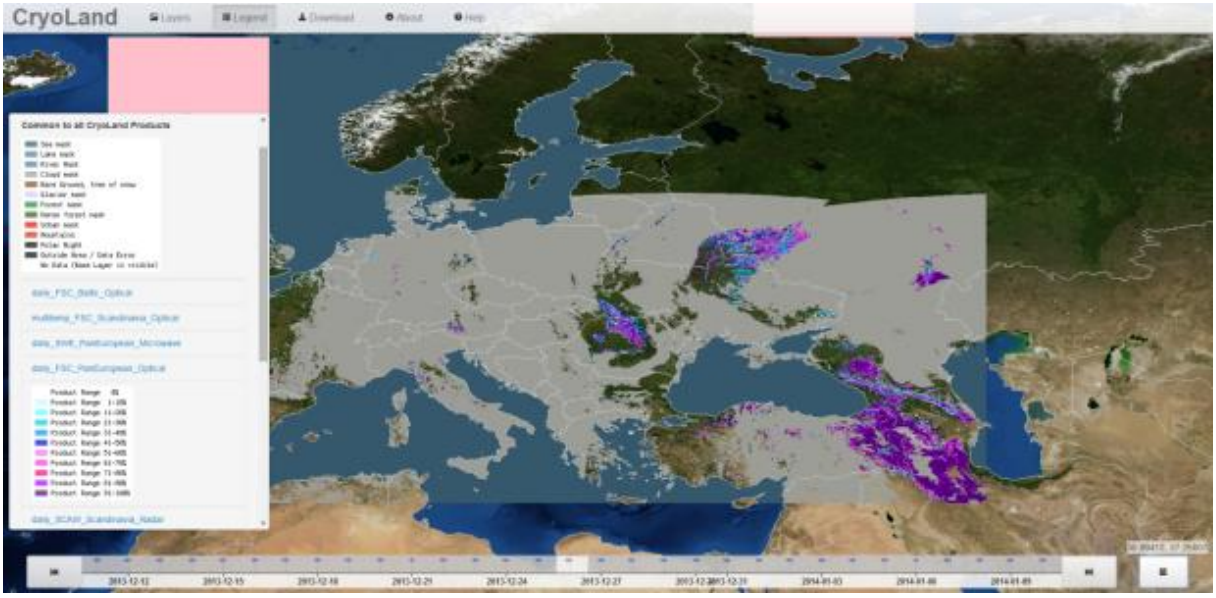
Beginning with November 2013 the National Meteorological Administration participates in the ASSIMO Project, in partnership with ESRI Romania. The project has been proposed within the Space Technology and Advanced Research STAR Research-Development and Innovation Program.

The general objective of the ASSIMO Project is to create the necessary frame for the use of the soil moisture products derived from satellite data in Romania. The followed stages are the following: validation and evaluation of the present-day and future soil moisture products derived from satellite data in the microwaves spectra, enhancing the experience necessary to implement the products obtained in the Societal Benefit Areas (SBA) relevant according to definitions in GEOSS.

Starting 1 February 2011, the National Meteorological Administration participates alongside other nine European institutions and private companies in the Cryoland Project financed by the European Commission in FP 7.

The main objective of the CryoLand Project is the creation of a GMES operational service aimed at supplying quantitative measurements of the terrestrial cover with snow and ice, of the water content within the snow layer a.o. for the whole European territory.

CryoLand products may be accessed online using the CryoLand GeoPortal. As a work tool, the interactive map combines a visualizing service (WMS – Web Mapping Service) and a data download (WCS - Web Coverage Service) one.



Example of graphical user interface using WMS service

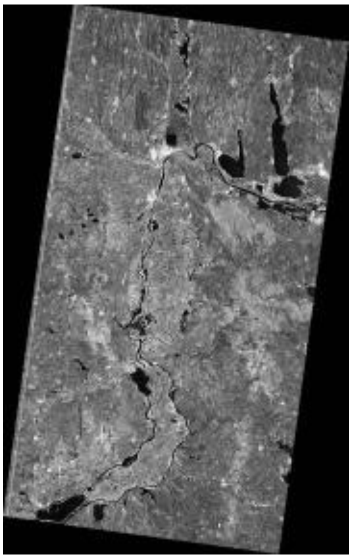
A very important research topic approached was related to the consequences of extreme weather phenomena in Romania using remote sensing and GIS techniques. A method was elaborated for processing images from the field of the microwaves, SAR-type (Synthetic Aperture Radar) images. In 2013 the method was adapted and applied for the RADARSAT-type images, so as to determine the land cover type in severe weather conditions (precipitation, cloud cover) that do not allow recording of optimum optical images. The images from the microwaves domain are recorded both during the day and during the night, in any atmospheric conditions, cloud cover situations, rain, snow or fog.

The steps of the processing method are:

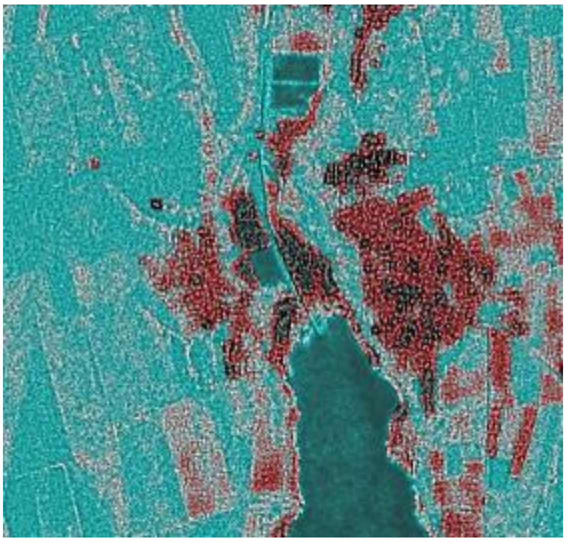
- image importing;
- image visualizing;
- applying available filters;
- selecting the best fit filter for the processed image;
- obtaining the colour image;
- exporting the image in graph format.

The filters available for processing the SAR-type images perform a convolution, morphologic or texture filtering. Through using the filters an improvement of the images is obtained through eliminating certain spatial frequencies. The spatial frequencies describe the variation of the pixel's value with distance and the images contain numerous such spatial frequencies. The Lee, enhanced Lee, Frost, enhanced Frost and Gamma filters were applied to the RADARSAT image of 29 June 2000. The image obtained with the Lee filter allowed the delimitation of the finest details in the image in comparison with the images obtained with the other filters.

The filtered image was transformed into a color image through the synthetic color procedure and the image in figure X testifies that this procedure allows a precise delimitation of the different land covers/uses (urban area, cultivated terrains, areas covered by water).



RADARSAT image from 29 June 2000



Detail – RADARSAT image of 6 June 2000 synthetic color

2. Research projects, working groups

2.1 International projects:

- *SNOWBALL Project*: Remote sensing, model and in-situ data fusion for snowpack parameters and related hazards in a climate change perspective;
- *MIDMURES Project*: Mitigation Drought in Vulnerable Area of the Mures Basin;
- *CLEANWATER Project*: Integrated system for protect and analyse the status and trends of water threatened by nitrogen pollution;
- "CryoLand – GMES Service Snow and Land Ice" – Framework: The Seventh Framework Programme, European Union – SPACE.
- SiAiR – Satellite & in-situ Information for Advanced Air Quality Forecast Services (2014-2015) – Financed by The European Space Agency (ESA)

2.2 National projects:

- *GEODIM Project*: Platform for GeoInformation in Support of Disaster Management;
- *DROMOSIS Project*: Drought monitoring based on space and in-situ data;
- ASSIMO – Assessment of Satellite Derived Soil Moisture Products over Romania" (2013-2016) – Framework: National Programme for Research, Development and Innovation (CDI) STAR Programme – Technology Space and Advanced Research

- UCLIMESA – Urban Heat Island Monitoring under Present and Future Climate”, (2013-2015) – Framework: National Programme for Research, Development and Innovation (CDI) – STAR Programme – Technology Space and Advanced Research

3. Organization of national and international conferences

- SNOWBALL Project: 1st Working Meeting, Bucharest, 19 September 2014;
- CLEANWATER Project: Final Workshop, Bucharest, 30 June 2014;
- FOSS4G Central and Eastern Europe, National Library of Romania, Bucharest, Romania, 16–20 June 2013;
- International Symposium “Historical Maps in Environmental Geosciences”, Cluj-Napoca, Romania, 21–23 June 2012;
- MIDMURES Project: Stakeholder Meeting, Arad, 17 October 2011;
- User Dissemination Workshop for ASSIMO Project, 29 May 2014

4. Participation of Romanian scientists at international symposia, courses and conferences

4.1 ***Symposia and conferences (selection)***

- Annual National Scientific Conference, Bucharest, November 2014;
- EUMETSAT Meteorological Satellite Conference, Geneve, Switzerland, 22–26 September 2014;
- FOSS4G Europe, Bremen, Germany, 15–17 July 2014;
- 14th International Multidisciplinary Scientific GeoConference – SGEM, Albena, Bulgaria, 17–26 June 2014;
- Second International Conference on Remote Sensing and Geoinformation of Environment (RSCy2014), Paphos, Ciprus, 7–9 April 2014;
- Annual National Scientific Conference, Bucharest, November 2013;
- International Workshop "Copernicus User Awareness and Training Event", Bucharest, Romania, 7–8 November 2013;
- SARTISS Baile Felix, Romania, 9–12 October 2013;
- 4th International Conference on Development, Energy, Environment, Economics (DEEE '13), Paris, France, 29–31 October 2013;
- EUMETSAT Meteorological Satellite Conference and the 19th Satellite Meteorology, Oceanography and Climatology Conference, Vienna, Austria, 16–20 September 2013;
- FOSS4G Central and Eastern Europe, Bucharest, Romania, 16 - 20 June 2013;
- 33rd EARSeL Symposium 2012, Matera, Italy, 3–6 June 2013;
- Annual National Scientific Conference, Bucharest, November 2012;
- EUMETSAT Meteorological Satellite Conference, Sopot, Poland, 3–7 September 2012;
- IEEE International Geoscience and Remote Sensing Symposium (IGARSS), Munich, Germany, 22–27 July 2012;
- Different approaches to drought monitoring – towards EuroGEOSS interoperability model
- 4th International Conference on Cartography & GIS, Albena, Bulgaria, 18–22 June 2012;
- 21st Century Watershed Technology Conference and Workshop: Improving Water Quality and Environment, Bari, Italy, 27 May–1 June 2012;
- 32nd EARSeL Symposium 2012, Mykonos Island, Greece, 21–25 May 2012;

- 7th International Workshop Digital Approaches to Cartographic Heritage, Barcelona, Spain, 19–20 April 2012;
- International Symposium on Climate Impacts on Low Flows and Droughts, Viena, Austria, 1-2 March 2012;
- Annual National Scientific Conference, Bucharest, November 2011;
- International Union of Geodesy and Geophysics (IUGG), Melbourne, Australia, 28 June–8 July 2011;
- International Conference on current knowledge of Climate Change Impacts on Agriculture and Forestry in Europe COST-WMO, Topolcianky, Slovakia, 3–6 May 2011;
- 6th International Workshop Digital Approaches to Cartographic Heritage, The Hague, Netherlands, 7–8 April 2011;
- The International Conference "Air and Water – Components of the Environment" 6th Edition, 21-22 March 2014, Cluj-Napoca, 2014
- European Geosciences Union (EGU) – General Assembly 2014, 27 April-2 May 2014, Vienna, Austria

4.2 *Courses*

- International Remote Sensing School for Hydrological Applications, Rome, Italy, 14th–18th July 2014;
- Project Manager (PM) training of the International Charter Space & Major Disasters, ESA, Esrin, Italy, 27th–28th June 2013;
- GEOSS Summer School: Advancing Earth Observation Data Understanding for Crisis Management and Emergency Response, Neptun, Romania, 29th August–4th September, 2011;
- Pytroll Workshop, 26 – 30 November 2012, Norrkoping, Sweden;
- International Summer School on Applications with the Newest Multi-spectral Environment Satellites, 10-18 June 2014, Bracciano, Italy

5. References:

5.1 *Books*

Irimescu, Anişoara, (2014), Foehnul din nordul Olteniei. Geneză şi Caracteristici, Edit. Academiei Române, 220p

Mateescu, Elena, Stăncălie, G., Alexandru, D., Irimescu, Anişoara, Nerţan, Argentina, Sandu, Rodica, Dumitru, A., Mihăilescu, D., Nistor, Maria, Coţan, M., Cornea, Ileana, Danila, M., Mereu, Valentina, Trabucco, A., Gallo, A., Spano, Donatella, (2014), "Adaptation measures in Romanian agriculture", SEE project – OrientGate: A structured network for integration of climate knowledge into policy and territoril planning, ISBN: 978-973-0-17760-2, 95p;

Stăncălie, G., Mateescu, Elena, Irimescu, Anişoara at all, (2012), „Guide to good practice for preventing drought and water scarcity in Mures River Basin", EU-DGE, Halting Desertification in Europe Programme, MIDMURES Project – Mitigation Drought in Vulnerable Area of the Mures Basin 07.0316/2010/582303/SUB/D1, 64 pp;

Roumenina, Elena, V. Kazandjiev, G. Stancalie. "Methodological Requirements for Testing PROBA-V and VEGETATION data for agricultural applications in Bulgaria and Romania". 01/2011; Publisher: Prof. Marin Drinov Academic Publishing House.

5.2 Chapters

Crăciunescu, V., Caian, Mihaela (2013), Information and decision support systems: AIRAWARE Romania. Environmental Tracking for Public Health Surveillance, CRC Press, p 378 – 386

Stăncălie Gh., Nerțan A., (2012), "Possibilities of deriving crop evapotranspiration from satellite data with the integration with other sources of information", chapter 20, p. 437 – 466, in Evapotranspiration – Remote Sensing and Modeling, edited by Ayse Irmak, InTech, Croatia, ISBN 978-953-307-808-3, 2011.

Stăncălie, G., Craciunescu, V., Nertan, A., et al. "Elaboration of products derived from geospatial data for flooding risk analysis in Romania". In book: RISK IN WATER RESOURCES MANAGEMENT, edited by: Bloschl, G; Takeuchi, K; Jain, S, et al. Book Series: IAHS Publication, Vol. 347, pages: 65-70, 2011.

5.3 *Papers in Journal with impact factor*

Irimescu, Anişoara, (2011), „The 18.09.2008 foehn winds in Northern Oltenia. Study case", Analele Universităţii din Oradea – Seria Geografie, XXI, 2/2011, ISSN 1454-2749 pp. 192-202;

Melin F., G. Zibordi, Th. Carlund, B.N. Holben, S. Ştefan (2013) Validation of SeaWiFS and MODIS Aqua/Terra aerosol products in coastal regions of European marginal Seas. OCEANOLOGIA 55(1): 1-25. DOI: 105697/oc.55-1.000

Nerțan, Argentina, Panaitescu, M., Stăncălie, G., Irimescu, Anișoara, Flueraru, C., Panaitescu, V. (2013), „Analysis of drought phenomenon using remote sensing data in Romania", recent Advances in energy, environment, economics and technological innovation, ISBN 978-960-474-343-8, pp. 204-213;

Timár, G., Bartos-Elekes, Z., Crăciunescu, V., Flueraru, C., Imecs, Z., Magyari-Sáska, Z., (2014), Danger doesn't vanish with the dikes: Comparison of the inundation pattern of the 2006 Danube floods and the historical topographic map of 1864 of South Romania. E-Perimetron, Vol. 9, No. 3, 2014, p. 146-152;

VERY SHORT RANGE FORECASTING (NOWCASTING)

The main very short-range forecasting research activity is developed at the Romanian National Meteorological Administration within the Laboratory of Nowcasting Techniques and Severe Weather Research.

1. Research orientation

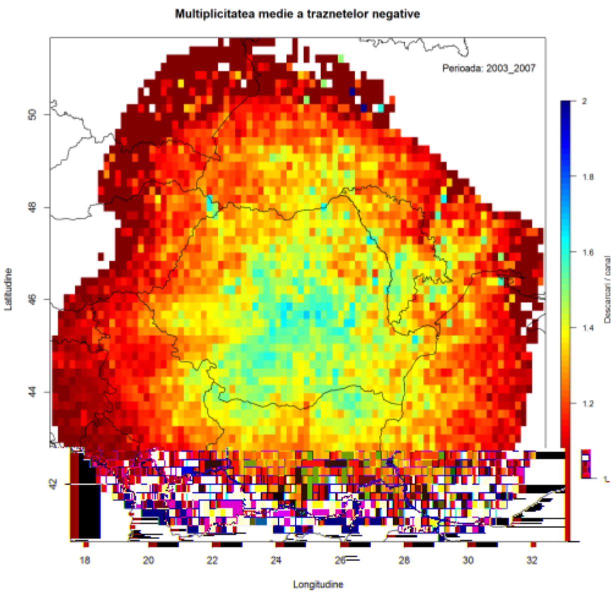
1.1 Forecasting and monitoring of severe storms

The activity of Laboratory of Nowcasting Techniques, which is the main laboratory for very short range forecasting, also includes operational activities. The very short range forecasting is dedicated only to severe phenomena that occur in Romania. Using the Romanian Radar Network (3 C-band and 5 S-band D Doppler radars), Romanian Lightning Detection Network (8 SAFIR3000 sensors) and satellite imagery (MSG data), the nowcasting forecasters monitor the convective activity. A special attention is paid to the radar structures that can produce severe phenomena and which are associated with regional conceptual models.

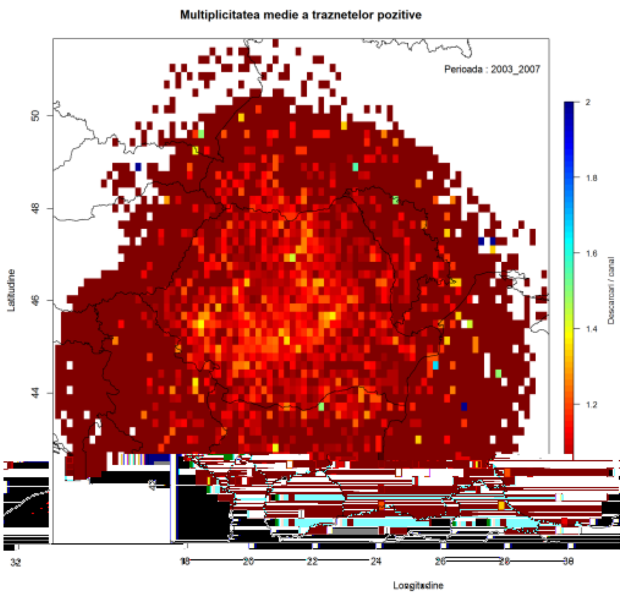
1.2 Analysis of cloud-to-ground lightning parameters

The assessment of spatial distribution and physical characteristics of cloud-to-ground lightning has been done. Some of the features have been analyzed depending on the lightning polarity:

- lightning multiplicity
- lightning energy
- lightning's action integral



Spatial distribution of density of negative cloud-to-ground multiplicity (10x10 km grid), over the interval 2003 - 2007



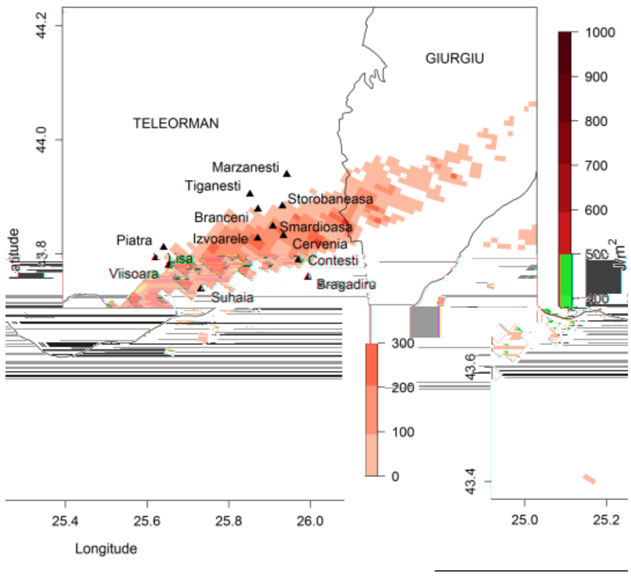
Spatial distribution of density of positive cloud-to-ground multiplicity (10x10 km grid), over the interval 2003 - 2007

The data, more than 1.75 million CG flashes, covers the entirety of Romania and were recorded between January 2003 and December 2005 and January and December 2007. Only few results of spatial analysis are briefly presented in the following. From the following images, one can observe that both negative and positive cloud-to-ground lightning present a central symmetry (azimuthally considering the center of the network) of the multiplicity. This symmetry is related with the capacity of the network to measure the secondary discharges. Nevertheless, one can observe azimuthal variations that can be associated with, for instance, the type of the underlying terrain structure (mountain, plain).

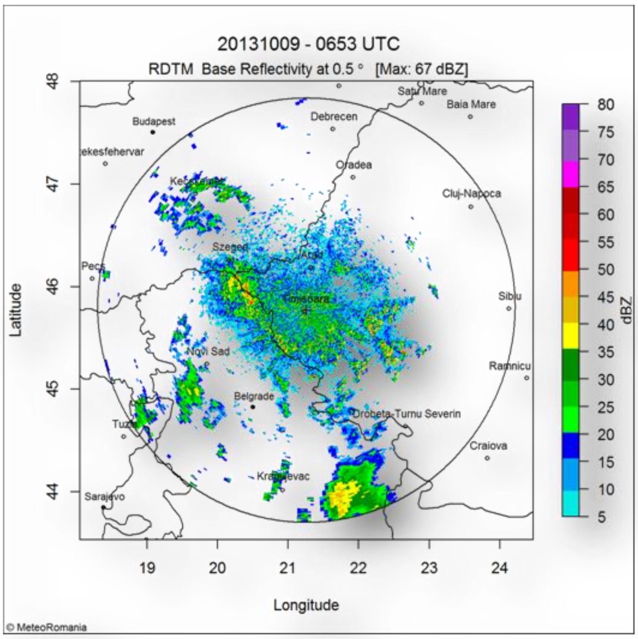
1.3 Radar data quality

Studies on assessment of radar data quality for rainfall estimation and for the development of additional products aimed to provide the forecasters with supplemental information on severe weather systems are carried on. Some of the radars operate in areas with complex topography and suffer from beam blockage caused by the presence of high terrain obstacles. Other radar systems operate near the sea, where the environmental parameters influence the propagation of the radar beam, causing the measurements to be biased, for instance, because of the anomalous propagation.

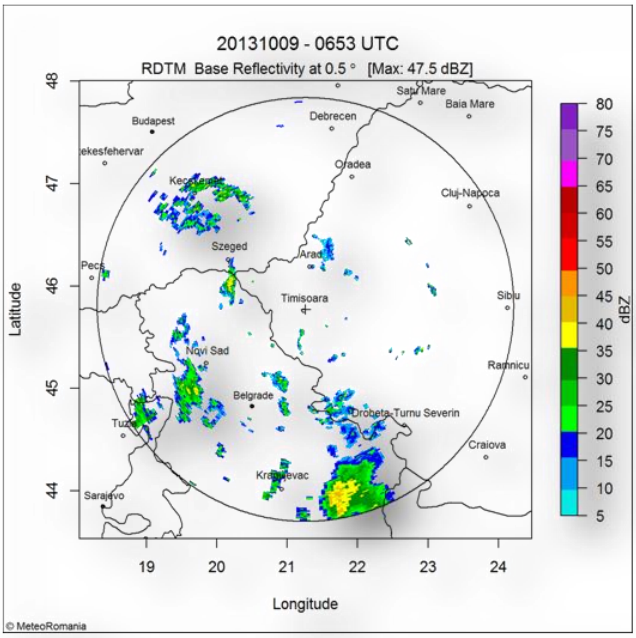
Therefore, either new radar products have been developed or complex algorithms were built as an extension of the existing ones in order to help the user of radar data. For instance, hail kinetic energy was derived from radar data to help evaluate the damaging potential of the hailstorms. The topic of detection and mitigation of the non-meteorological echoes was approached by developing and testing an algorithm that reduces the influence of non-meteorological echoes on radar measurements.



Radar-derived hail kinetic energy for a hailstorm that occurred on 25 May 2013.



Picture showing contaminated radar reflectivity sampled at the 0.5° elevation angle.



Picture showing the spatial distribution of radar reflectivity sampled at the 0.5° elevation angle, after the non-meteorological echoes have been removed.

2. Participation of the Romanian specialists in working groups involved in national and international projects and programs

- Workshops and meetings of Building Resilience to Disasters in Western Balkans and Turkey Project
- EUMETCAL Project
- European Reanalysis and Observations for Monitoring **-** EURO4M Project
- Changes in Climate Extremes and Associated Impact in Hydrological Events in Romania – CLIMHYDEX Project

3. Organization of national and international scientific conferences and training courses

- On-the-job Training on Severe Weather Forecasting and Warnings, 3-21 September 2012
- On-the-job Training on Severe Weather Forecasting and Warnings, 13-31 May 2013, and 03-21 June 2013

4. Participation of Romanian scientists at international symposia, courses and conferences

- 6th European Conference on Severe Storms – ECSS, Palma de Mallorca, Spain, 3-7 October 2011
- 7th European Conference on Radar in Meteorology and Hydrology, Toulouse, France, 24-29 June 2012
- European Geosciences Union General Assembly, Vienna, Austria, 07-12 April 2013
- 7th European Conference on Severe Storms – ECSS, Helsinki, Finland, 3-7 June 2013
- Weather Radar Applications in Nowcasting for Weather Forecasters, Langen, Germany, 17-21 June 2013
- Annual Scientific Conference of Romanian National Institute of Hydrology, Bucharest, Romania,

23-26 September 2013

- 14th International Balkan Workshop on Applied Physics, IBWAP-2014, Constanta, Romania, 2-4 July 2014
- 8th European Conference on Radar in Meteorology and Hydrology, Garmisch-Partenkirchen, Germany, 1-5 September 2014
- EUMETSAT Meteorological Satellite Conference, Geneva, Switzerland, 22-26 September 2014

5. Scientific papers in peer-reviewed journals

Burcea S., Cheval S., Dumitrescu A., Antonescu B., Bell A., Breza T. 2012: Comparison between radar estimated and rain gauge measured precipitation in the Moldavian Plateau. *Environ. Eng. Manag. J.*, **11-4**, 723-731

Antonescu B., Burcea S., Tanase A. 2013: Forecasting the onset of cloud-to-ground lightning using radar and upper-air data in Romania. *Int. J. Climatol.*, **33**, 1579–1584

Burcea S., Dumitrescu A. 2012: Impact of wind farms on weather radar data and spatial rainfall estimation. *Rom. Rep. Phys.*, **64-4**, 1072-1084

Carbunaru D., Stefan S., Burcea S. 2013: Weather radar velocity field configurations associated with severe weather situations that occur in southeastern Romania. *Rom. Rep. Phys.*, **65-4**, 1454-1468

Carbunaru D., Stefan S., Sasu M., Stefanescu V. 2013: Analysis of convective thunderstorm split cells in south-eastern Romania. Doi: http://dx.doi.org/10.1155/2013/162541

Carbunaru D., Sasu M., Burcea S. 2014: Detection of hail through the three body scattering signatures and its effects on radar algorithms observed in Romania. *Atmosfera*, **27-1**, 21-34.

AERONAUTICAL MET SERVICES

In accordance with the Law of Meteorology, in Romania the aeronautical meteorological services are provided by the Romanian Air Traffic Services Administration (ROMATSA), separately from the National MET Administration (NMA). There is a very good collaboration, on a contractual basis, between ROMATSA and NMA, which also includes clauses addressing issues with respect to the quality of the data provided. The data provided by NMA to ROMATSA covers a large range of data, including synoptic, upper air and NWP data, as well as weather radar and satellite data. The specific aviation products are issued by ROMATSA in full compliance with the ICAO Annex 3 requirements, through its 16 aeronautical meteorological stations located on the main civil airports in Romania and through the National Center for Aeronautical Meteorology which also fulfills the role of watch office for the Flight Information Region (FIR) Bucharest. ROMATSA was certified by the national supervisory authority, represented by the Romanian Civil Aviation Authority (RCAA), as air navigation services provider organization for the provision of the aeronautical meteorological services in Romania, having regard to the provision of Regulation (EC) No.550/2004, as amended, of Regulation (EC) No. 216/2008, as amended, and of Regulation (UE) nr.1035/2011.

Recently ROMATSA replaced its weather data processing system with a new one from IBL Company and upgraded its AWOS software for all the systems installed on the 16 airports in Romania. ROMATSA has been also certified by RCAA as authorized Training Center for Aeronautical Meteorology, whose main objectives are obtaining and maintaining competencies for the aeronautical meteorological personnel according to the latest requirements as defined by ICAO and WMO. Also the training center is delivering training for the MET domain to the air traffic controllers and other staff with aviation interest. Related to that, it is worth to mention that the WMO requirements regarding training, competencies and competence assessment have been fully implemented since early 2013.

I A P S O ACTIVITIES IN ROMANIA

2011 - 2014

Romanian IAPSO Committee

President and National Correspondent:	**Dr. Nicolae PANIN**	**GeoEcoMar** 23-25 Dimitrie Onciu Street 024053 Bucharest, Romania Tel: +40-21-252 25 94 Fax: +40-21-252 25 94 e-mail: panin@geoecomar.ro
Members:	**Designated representative**	**IRCM** National Institute for Marine Research and Development "Grigore Antipa" Constanta 300 Mamaia Bulevard 900581 Constanta Tel: +40-241-543288 Fax: +40-241-831274 www.rmri.ro
	Designated representative	**DHM** Maritime Hydrographic Directorate 1 Fulgerului Street, 900218 Constanta Tel: +40-241-651040 Fax: +40-241-513065 www.dhmfn.ro
	Designated representative	"Mircea cel Batran" Naval Academy 1 Fulgerului Street, 900218 Constanta Tel: +40-241-626200 Fax: +40-241-643096 www.anmb.ro
Secretary:	**Florin DUTU**	**GeoEcoMar** 23-25 Dimitrie Onciu Street 024053 Bucharest, Romania Tel: +40-21-252 55 12 Fax: +40-21-252 25 94 e-mail: fdutu@geoecomar.ro florin.dutu@gmail.com

Report of the Romanian National IAPSO Section
Contributions in Physical Sciences of the Oceans

Romanian marine sciences researches, relative to IAPSO topics, have been carried out between 2011 - 2015 period by several research institutes located both in Bucharest and Constanta.

Most of these studies are focused on the western Black Sea Basin, its coastal zone and on its relationship with the Danube River. The main research have been carried out in the framework of the National Research Programs like Core program (Program Nucleu) and PNII founded by the Romanian Ministry of Education and Research and in the framework of the FP7 European Programs.

International or bilateral programs and projects represented also a very important support and framework of marine sciences development in Romania. These programs are mainly in collaboration with the European Commission. Bilateral co-operation projects between Romanian and French, German, Italian, US, Russian, Ukrainian, Bulgarian, Greek, Norwegian and Turkish teams of scientists constituted also a good opportunity to develop the marine sciences in the Black Sea area.

The technical facilities and logistics available for the marine research has grown continuously as a consequence of the participation of Romanian scientists at national and international research projects.

As a result of a European Project coordinated by the National Institute of R&D for Marine Geology and Geo-ecology –GeoEcoMar, in the framework of the EU cross border cooperation program between Romania and Bulgaria, "The Black Sea Security System – Early Warning to MarineGeoHazards (2011-2013) entered in operation in June 2013.

The Black Sea Security System – the Early-Warning System to marine geohazards *is composed of three main sub-systems as follows:*

1. **The Euxinus sub-system -** the Black Sea regional early warning system to marine geohazards
2. **The GeoPontica sub-system -** the first on-line geodynamic surveillance network in the entire Black Sea region
3. **The Black Sea Seismicity sub-system** – an infrastructure for monitoring and studying the seismicity and the geological structure of the Western Black Sea Coastal Zone

1. The EUXINUS sub-system - the Black Sea regional early warning system to marine-geohazards

The EUXINUS sub-system is composed of:

- *5 complex, fully automatic marine stations (buoys), placed close to the shelf break, with automatic equipment for measuring the characteristics and the dynamics of water and air masses. Tsunameters are attached to each station.*
- *A coastal station, placed in front of the coastline at Mangalia (~ 15 m water depth) for measuring the characteristics and the dynamics of water and air masses in the coastal zone.*

The off-shore stations are measuring water characteristics at two water depth levels:

- At 5 m water depth: water temperature; conductivity; Oxygen content; turbidity; chlorophyll; pressure; speed and direction of currents (ADCP)

- At 70 m water depth: temperature; conductivity; chlorophyll; pressure; speed and direction of currents (ADCP)

The measured meteorological characteristics are: air temperature; air pressure, humidity, wind direction and speed.

The Mangalia Coastal station is measuring:

- meteorological characteristics: air temperature; air pressure, humidity, wind direction and speed;
- At 5 m water depth: water temperature; conductivity; Oxygen content; turbidity; chlorophyll; pressure; speed and direction of currents (ADCP)

Locations of gauges on the western Black Sea Shelf

The ADCP is processing data collected during 10-20 minutes related to wave characteristics for deducing directional wave spectrum and calculating Hmo (Significant amplitude); Hmax (Maximum Amplitude); Tm (Mean Period); Tp (Peak Period); Dm (Mean waves direction) and Dp (Peak waves direction).

2. The GeoPontica sub-system - the first on-line geodynamic surveillance network in the entire Black Sea region

The GeoPontica includes 18 on-line geodynamic stations located along the Romanian-Bulgarian coast.

Based on EU Terrestrial Reference System and Vertical Reference Network, GeoPontica provides information on:

- Vertical movements of the Earth crust as isostasy, epeirogenetic up-lift, subsidence , sediment compaction;
- Horizontal movements of the Earth crust due to global tectonics (motion of the lithosphere plates) or relative movements of tectonic blocks;
- Changes of the mean sea level position.

Locations of the Geodynamic stations along the shore line

3. The Black Sea Seismicity sub-system

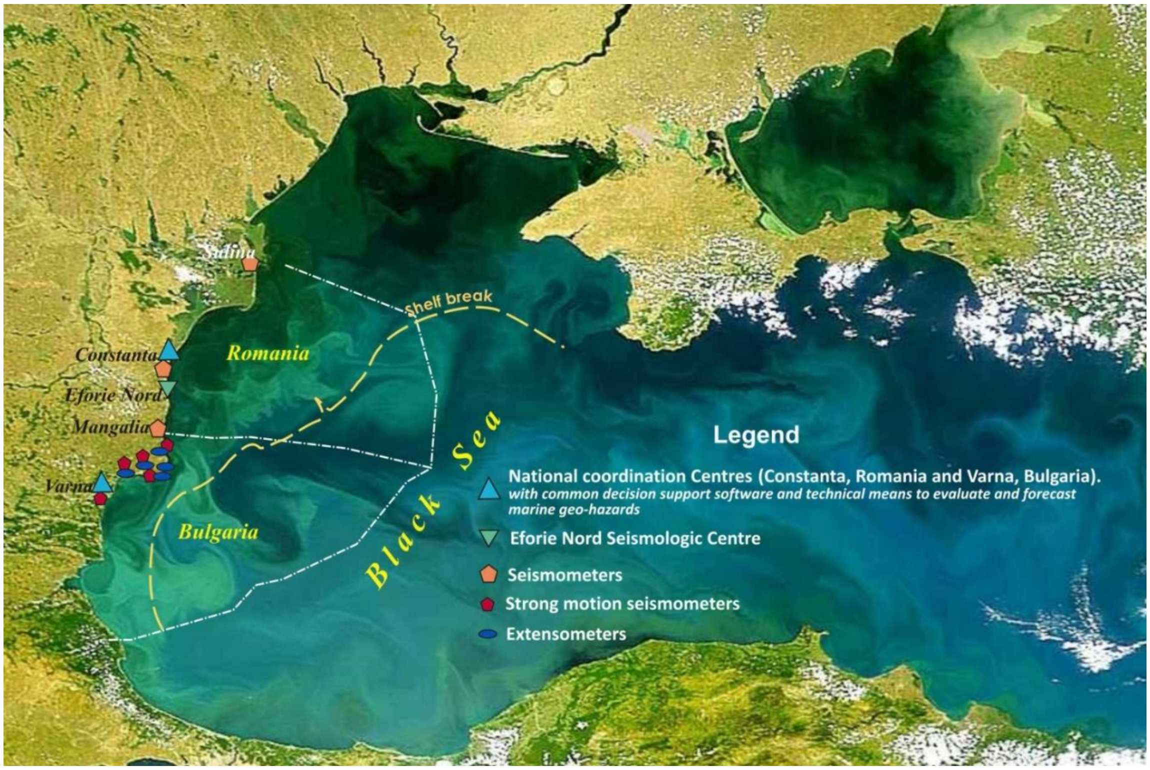
The Black Sea Seismicity System is composed of:

- 3 seismometers, 5 strong motion seismometers and 5 extensometers;
- 7 Ocean Bottom Seismometers;
- 1 Marine 2D Seismic Acquisition System installed on-board the R/V "Mare Nigrum"

The Black Sea Security System – MARINEGEOHAZARD – a Marine Hazards Monitoring and Early Warning System represents the first marine high-tech system installed in the Western Black Sea aiming at protecting coastal zone population, environment and socio-economic objectives.

The System allows an immediate detection and evaluation of the magnitude and possible effects of natural and man-made crisis – hazards and an early notification of specialised emergency response authorities. A special Decision Support Tool of the System assesses and predicts the occurrence of hazards and their magnitude.

As the Western Black Sea coast is subject to a high risk of marine hazards occurrence the Black Sea Security System represents an extremely useful tool for a sustainable management and protection of the coastal zone of Bulgaria and Romania.



Black Sea Seismicity sub-system

The system is providing for the first time a continuous year-long flux of data about the quality and dynamics of water and sediments within the offshore zone of the Western Black Sea as well as about the meteorological characteristics of this zone. The data refers not only to the superficial level of the sea but also to the near bottom layer of water.

These data contribute to the permanent environmental monitoring of the western Black Sea that is under direct impact of largest European rivers as Danube, Dnieper and Dniester.

The Black Sea Security System enters from the beginning the major EU Earth and Ocean Observing Systems and ESFRI projects:

- GOOS – Global Ocean Observing System, specifically Black Sea GOOS, and EOS – Earth Observing System
- EMSO – European multidisciplinary seafloor observation infrastructure - a European network of fixed point, deep sea observatories aiming at a real-time, long-term monitoring of environmental processes related to the state and interaction between the geosphere, biosphere, and hydrosphere
- European Plate Observing System (EPOS) – Research Infrastructure and e-Science for Data and Observatories on Earthquakes, Volcanoes, Surface Dynamics and Tectonics
- EURO-ARGO – Research infrastructure for ocean science and observations
- LIFE WATCH – Science and technology infrastructure for biodiversity data and observatories

The system is operational from June 2013.

Another important project is **DANUBIUS RI - The Danube International Centre for Advanced Studies in the River – Delta – Sea systems: a Pan-European Research Infrastructure.**

1. European River – Sea systems are among the most environmentally impacted regions in the world, after centuries of agricultural intensification, deforestation, industrialization and explosion of urban settlements and there is an urgent need for special programmes of scientific, sustainable and adaptive measures for rehabilitating these systems. In the last decades, Europe has taken the lead at the global level in trying to find scientifically sound management solutions that would support the sustainable use of the major river systems and the Water Framework Directive is the first initiative of its kind, which aims to obtain the good quality status for the waters and sediments of an entire continent. But such aims require a strong scientific support.
2. Recognising the urgent need to tackle the environmental constrains put on river-delta-sea systems, scientific communities from all over Europe (Austria, Bulgaria, Germany, Greece, Hungary, Ireland, Italy, Lithuania, the Republic of Moldova, the Netherlands, Serbia, Spain, the United Kingdom, Ukraine, etc.) have backed up the Romanian initiative to create the Danube International Centre for Advance Studies for River-Delta-Sea Systems – DANUBIUS-RI.
3. DANUBIUS-RI will be a world-leading pan-European distributed research infrastructure supporting research, innovation and knowledge exchange that will enable excellent interdisciplinary research in river – sea systems for creating their knowledge based management with high economic impact. The physical structure of DANUBIUS-RI will comprise *Supersites* and *Nodes* across Europe led by a *Hub* and a *Data Centre* in Romania. Additionally DANUBIUS-RI will have a Technology Transfer Centre located in Ireland. This structure will offer an integrated suite of facilities, services and expertise for research scientists and other stakeholders in Europe and globally.
4. The *Hub* will provide leadership and governance, coordination and standardisation of activities, communication with other *Supersites*, *Nodes* and research infrastructures and major stakeholders, as well as with key scientific, educational and analytical capabilities. *Supersites* will provide the focus for observation, research and modelling at locations of high scientific importance and opportunity, covering the main River - Seas systems in Europe.
5. DANUBIUS-RI will be unique and the most innovative research structure dedicated to sustainable management of the River–Sea systems in Europe and even in the World for knowledge based socio-economic development of these systems. The main scientific and innovation, managerial and educational activities of DANUBIUS-RI are listed in the White Book (DANUBIUS Framework Programme).
6. DANUBIUS-RI is intended to have a legal basis as a European Research Infrastructure Consortium (ERIC). The General Assembly, the decision-making body, will be composed of representatives of Member countries of DANUBIUS-RI. Countries may be Members through making a several year commitment (an initial commitment of five years is foreseen), involving payment of an annual membership fee. Observer status, with a lower annual fee (or free of charge) but no voting rights, will also be available to countries and to international organisations.
7. Access to the facilities, services and expertise of DANUBIUS-RI will be open to any research scientist or stakeholder subject to peer review, feasibility and any intellectual property considerations. Access may involve a fee, depending on the service or facility provided or further use

of knowledge (e.g. for education purposes it could be free of charge), which will be lower for scientists in Member country organisations.

8. As DANUBIUS-RI has the capacity to respond to the long term needs of the European research communities and to foster sustainable social and economic development of the most disadvantaged regions, it was proposed as a new project to be accepted on the ESFRI (European Science Forum for Research Infrastructures) 2016 updated roadmap.

RESEARCH INSTITUTIONS FOR ROMANIAN NATIONAL IAPSO SECTION

The National Institute of Hydrology and Water Management (INHGA)

The activity of the institute is characterized by a dynamics of the preoccupations permanently connected to the requests that have developed over the years, so that now we have a comprehensive experience that is the basis for approaching new issues occurred in the field of the sustainable water resources management and the correlation with the European legislation for Romania's integration into the European Union.

The National Institute of Hydrology and Water Management has also as attributions, services and research-development activities on large expertise areas that cover in practice all water management and hydrological fields (in natural and infrastructure development regime of waters).

The address of the INGHA is:

Sos. Bucuresti-Ploiesti 97 sector 1, Bucharest

Tel.: +40-21-318 1115; +40-21-318 1114; +40-21-317 9992

Fax: +40-21-318 1116

In the frame of the institute there are elaborated:

- hydrological, hydrogeological and water management studies and researches;
- diagnosis;
- warnings in case of dangerous hydrological phenomena;
- hydrological forecast of national and transboundary interest;
- synthesis, yearbooks and monographs;
- environmental studies and balances;
- Eco-hydrological studies and researches.

Objectives:

Research activities and public operational services of national and international interest, for:

- population and goods protection
- improvement of life quality
- environment protection

Services & Products:

- Hydrological forecasts in order to underline the regime of reservoirs exploitation
- Hydrological yearbook of the surface waters
- Cadastre of the surface and underground waters
- Hydrological synthesis and regionalizations
- Hydrological studies regarding the hydrological parameters necessary for design and exploiting the engineering hydrotechnical structures related to water
- Hydrogeological studies for assessing the underground water resources and their rational utilization
- Infrastructures development plans of the hydrological basins
- Regional strategies of development in the water field
- Studies of flooding occurrence
- Impact and environmental balances studies
- Specifications for obtaining the water management licenses
- Studies and projects for reconstructing/restoring the water courses

Advanced researches regarding the following issues:

- influence of the climatic changes upon the hydrological cycle
- occurrence and propagations of flash floods on water courses
- water resources management during droughts periods
- eco-technique of water courses
- displacement of pollution waves
- determination of flood vulnerability and afferent risks

National Projects

National Projects finalized in the last 4 years

DESWAT „Destructive Water Abatement and Control of Water Disasters" (2005-2014)

ADER „Climate change and framework impact over the costs and water resources in the southern part of Romania (2011-2014)

EMHIPAD „Multidisciplinary evaluation of the hydrodynamic and hydrochemical processes to diagnose the vulnerability in case of pollution of the water resources in Southern Dobrogea" (2008-2011)

MIDMURES „The reduction of the drought in the vulnerable area in the Mures basin" (2011 -2012)

Ongoing National Projects

CLIMHYDEX „ Changes in climate extremes and associated impacts on hydrological events in Romania" (2012 – 2015)

VULMIN „ Settlements and environmental vulnerability to floods in Romania in the context of global environmental changes"(2012-2015)

PSMLAND „Analysis of Precipitations and Soil Moisture Conditions Triggering Lanslide Occurrence in Subcarpathian Area between Prahova and Ialomita Valley (2013-2015)

MATES-nZEB „ Management of local aquifers as thermal storage technology for clean energy buildings” (2014-2016)

International Projects

International projects finalized in the last 4 years

CC-WATERS „Climate Change and Impacts on Water Supply” (2009-2012)

SEE HYDROPOWER „Hydropower targeted to improve water resources management for growing renewable energy production” (2009-2012)

ENVIROGRIDS „Building Capacity for a Black Sea Catchement Observation and Assessment System supporting Sustainable Development” (2009-2013)

IS-ENES 1 „InfraStructure for the European Network for the Earth System Modelling” (2009-2013)

RESTORE „Rivers: Engaging, Supporting and Transferring knowledge for Restoration in Europe” (2011-2013)

CLEANWATER „ Integrated system for the protection of water resources threatened by pollution with nitrogen compounds” (2010-2014)

ECLISE „ Developer climate information services for Europe” (2011-2014)

Ongoing international Projects

TR 10 IB EN 01 „Capacity building to implement the Flood Directive in Turkey” (2012-2014)

DANUBE WATER „Danube Water Integrated Management” (2012-2015)

FLOOD-CBA „ Platform of information for assessing the costs and benefits of flood prevention measures” (2013-2015)

EAST AVERT „The prevention and protection against floods in the upper Siret and Prut River Basins, through the implementation of a modern monitoring system with automatic stations” (2013-2015)

IS-ENES 2 „InfraStructure for the European Network for the Earth System Modelling” (2013-2017)

SNOWBALL „ Integration of remote sensing data, in modeling and in- situ to assess the parameters of snow and hazards associated with climate change perspective” (2014-2017)

The Romanian Marine Research and Development Institute “Grigore Antipa” (RMRI)

Romanian Marine Research Institute (RMRI) has been established in 1970 by unification of the existing marine research institutes from Romania, at that time. In 1999, it was reorganized as National Institute for Marine Research and Development „Grigore Antipa” (NIMRD), according to the Governmental Decision 686/ 23.08.1999.

The institute is the heritage of 80 years of institutional oceanology in Romania, starting with 1926 and 1932, moments of establishing of the first marine research institutes, created by prof. Ioan BORCEA and by prof. Grigore ANTIPA.

Nowadays, the institute is a representative national organization with a pluridisciplinary and interdisciplinary structure and functioning under the coordination of the Ministry of Environment and Water Management. NIMRD carries out basic, applied and technological research, crucial for the knowledge, protection and management of the coastal zone and marine environment, oceanography, marine and coastal engineering, also management of the marine living resources in the Black Sea and Planetary Ocean.

It is the support for solving the national and international problems regarding Romanian marine sector and the Black Sea Exclusive Economical Area, according to the Romania's tasks assumed within the international conventions regarding its activity. Also, NIMRD insure the national, regional and European marine strategies/ plans implementation.

According to the establishing legal document, NIMRD is the technical operator of the physic, chemical and biological national network for marine waters and for coastal erosion surveillance.

The RMRI address is: 300 Mamaia Boulevard, RO-900581, Constanta, Romania

Tel: +40-41-543 288; Fax: +40-41-831 274

E-mail: office@alpha.rmri.ro

RMRI is structured as follows:

- ✓ Laboratory of Oceanography
- ✓ Laboratory of Marine Ecology
- ✓ Laboratory for Ecological Reconstruction
- ✓ Laboratory of Fishery Resources
- ✓ Laboratory of Marine Technology
- ✓ Laboratory of Marine Biochemistry
- ✓ Nuclear Unit
- ✓ Computer Office

National Projects

- Influence of the river input on the chemical composition and the trophic state of the Romanian transitional and coastal waters with the view to the joint implementation of the Water and Marine Strategy Framework Directives
- Creating a methodology for the use of dispersants in the Black Sea that can form the basis for developing a legal framework on the use of dispersants in the Black Sea
- Characterization of benthic and plankton communities of the Romanian continental shelf
- ECOMAGIS
- Research and Restoration of the Essential Filters of the Sea (REEFS)

International Projects

- Coordinating research in support to application of Ecosystem Approach to Fisheries (EAF) and management advice in the Mediterranean and Black Seas (CREAM)
- Towards COast to COast NETworks of marine protected areas (from the shore to the high and deep sea), coupled with sea-based wind energy potential (COCONET)

- Policy oriented environmental research in the southern European Seas (PERSEUS)
- Options for Delivering Ecosystem - Based Marine Management
- Industrial Symbiosis Network for Environment Protection and Sustainable Development in Black Sea Basin (SymNet)
- Radiation background of Black Sea coastal environment
- Improve the integrated monitoring in the Black Sea under the Marine Strategy Framework Directive
- Pan-European infrastructure for ocean and marine data management
- Bio-Optical Characterization of the Black Sea for Remote Sensing Applications
- Consultancy Services for the coastal area in from of Danube Delta
- Ocean Color - Application for the western Black Sea
- STRENGTHENING THE REGIONAL CAPACITY TO SUPPORT THE SUSTAINABLE MANAGEMENT OF THE BLACK SEA FISHERIES (SRCSSMBSF)- 88
- Towards A Clean, Litter-Free European Marine Environment Through Scientific Evidence, Innovative Tools And Good Governance (CLEANSEA)
- Comparative of Plankton Status Characteristics in Chinese Daya Bay and Romanian Black Sea Coast and the Response to Anthropogenic Modifications
- Co-Creating Ecosystem Based Fisheries Management Solutions (MareFrame)

The National Institute for Marine Geology and Geo-ecology – GeoEcoMar

The National Research and Development Institute for Marine Geology and Geo-ecology – GeoEcoMar of Romania, is a research-development institute established in 1993, under the co-ordination of the Romanian Ministry of Education and Research. GeoEcoMar represents the focal point of national excellence in research and consultancy on marine, coastal, river and lacustrine geology, geophysics and geoecology, as well as a reference centre for Marine and Earth Sciences. Due to its technical capabilities and scientific performance achieved in a short period of time, the centre has become since 1996 an "institute of national interest", its main research goal being the complex study of the Danube River-Danube Delta-Black Sea macro-geosystem. The main scientific activities and expert services of GeoEcoMar are: geology, sedimentology, stratigraphy, paleontology, geochemistry, mineralogy, grain size analysis; coastal researches and integrated management, geophysics (seismo-acoustics, 2D marine seismics, magnetometry, gravimetry, electrometry), environmental quality investigations (hydro-chemistry, gas chromatography, eco-toxicology, greenhouse gas emissions), real time monitoring and study of marine geo-hazards, geo-archaeology and geological mapping of the Romanian Black Sea continental shelf.

The institute actively participated in different Framework Programmes of the European Union since the days of FP4. In the 7th Framework Programme GeoEcoMar has been involved in projects such as DANCERS (overall coordination), ARCH, CLIMATEWATER, HYDRALAB IV, PERSEUS, EUROFLEETS-1, EUROFLEETS-2, COCONET, CGS EUROPE, UP-GRADE BLACK SEA SCENE, FAST, RISES-AM, etc.

GeoEcoMar jointly coordinates the efforts for the development of the Danube International Centre for Advanced Studies for River-Sea Systems – DANUBIUS-RI, as pan-European Research Infrastructure towards inclusion on the future ESFRI Roadmap.

Starting with 2006, the institute has implemented a Quality Management System applied to geology, geoecology and geophysics. This quality system has been authorized by Lloyd's Register Quality Assurance (Romania), according to ISO 9001:2008 (SR EN ISO 9001:2008), approval certificate no. 170539 (2006 and certificate renewal in 2009, 2012, 2015).

NIRD GeoEcoMar has known a continuous scientific and financial growth, being recognized at national and international levels.

The GeoEcoMar's addresses are:

Headquarters: 23-25 Dimitrie Onciul Street,RO-024053
Phone: +40-21-252.55.12
Phone/Fax:+40-21-252.25.94
E-mail: headquarter@geoecomar.ro

Constanta Branch: 304 Mamaia Blv., RO-900581
Phone: +40-241-51.01.15
Phone/Fax: +40-241-69.03.66
E-mail: branch.constanta@geoecomar.ro

The structure of GeoEcoMar corresponds to its main scientific aims. GeEcoMar has many scientific departments (laboratories), a technical and navigational department and an operational-financial-administrative one. The departments of the institute are:

- Marine Geology and Sedimentology
- Seismo-Acoustic, Digital Cartography, GIS, Data Base
- Geophysical Methods of Deep Investigation
- Geochemical, Geoecological and Sedimentological Analysis
- Maintenance and Management of Scientific Equipment
- Coastal Zone Research and Management
- Project Management and Marketing
- Quality and Safety Management
- Environmental Quality Investigation

GeoEcoMar in the present has a multidisciplinary marine research vessel ("***MARE NIGRUM***" - 3,000 t displacement, 82 m length) and it is operational since 2003.

R/V Mare Nigrum

The institute has also a research vessel (R/V **"*ISTROS*"**, 32-m length) and a floating laboratory **("*HALMYRIS*"**, for 22 researchers) for research campaigns within the Danube River and its Delta.

R/V Istros and the Houseboat Halmyris

For more information regarding the GeoEcoMar's structure, main scientific objectives, equipment and other capabilities, visit the web site: www.geoecomar.ro

International Projects

Structural funds:

Structural funds for the protection of the environment

- **Priority Axis V.** Implementation of the adequate structures to prevent natural risks in most exposed areas. Major intervention domain no. 2. Reduction of coastal erosion

DG REGIO

Cross Border Cooperation Romania–Bulgaria:

- **MARINEGEOHAZARD (2011-2013):** Set-up and implementation of key core components of a regional early warning system for marine geohazards of risk to the Romanian-Bulgarian Black Sea coastal area
- **HERAS (2013-2015):** Submarine Archaeological Heritage of the Western Black Sea Shelf

South Eastern Europe Programme

- **ECOPORT8 (2009-2012):** Environmental Management of Transborder Corridor Ports
- **TEN ECOPORT (2013-2015):** Environmental Management of Transborder Corridor Ports – continuation

DG ENVIRONMENT

- **MISIS (2012-2014):** MSFD Guiding Improvements in the Black Sea In Monitoring System
- Technical and administrative support for the joint implementation of the Marine Strategy Framework Directive (MSFD) in Bulgaria and Romania

LIFE + Programme:

- **SEDI.PORT.SIL:** Recovery of dredged SEDIments of the PORT of Ravenna and SILicon extraction

DG MARE

- **EMODnet**: European Marine Observation and data Network
- **EUSEADATANET2:** physical habitats (part of EMODnet)

Projects in EC DG Research Framework Programmes

Framework Programe VII:

- **DANCERS (2013-2015):** DANube macroregion: Capacity building and Excellence in River Systems (basin, delta and sea) (GeoEcoMar – overall coordination)
- **CLIMATEWATER:** Bridging the gap between adaptation strategies of climate change impacts and European water policies
- **EUROFLEETS:** Towards an alliance of European research fleets
- **EUROFLEETS 2:** Towards an alliance of European research fleets. Continuation.
- **HYPOX**: In-situ monitoring of oxygen depletion in hypoxic ecosystems of coastal and open seas, and land-locked water bodies
- **UP-GRADE BS-SCENE:** Up-grade Black Sea scientific network
- **FENCO ERA-NET:** Fossil energy coalition. Scrutinizing the impact of CCS communication on the general and local public
- **HYDRALAB IV (2010-2014):** More than water. Dealing with the complex interactions of water with environmental elements. sediment, structures and ice
- **ARCH:** Architecture and roadmap to manage multiple pressures on lagoons
- **PERSEUS:** Protecting European Seas and border through the Intelligent use of Surveillance
- **COCONET:** Towards COast to COast NETworks of marine protected areas (from the shore to the high and deep sea), coupled with sea-based wind energy potential
- **CGS EUROPE:** Pan-European coordination action on CO2 Geological Storage
- **CO2Stop:** Assessment of CO2 storage potential in Europe
- **FAST:** Foreshore Assessment using Space Technology

- **RISES-AM:** Responses to coastal climate change: Innovative Strategies for high End Scenarios – Adaptation and Mitigation
- **In Black Sea ERA NET – 3 projects:** SDG Black (coordination), Wapcoast (coordination) and MARCY (participants)

National Projects

PN II

1. The circulation of water and sediments on the Romanian coast: measurements with modern technologies and mathematical modeling to develop a decision support system for coastal protection
2. The use and development of new methods for investigating and dating of major changes in climate and sea level in the Danube Delta and the Black Sea in order to reconstruct the evolution and predicting risks
3. The study of complex semi- closed ecosystems (alpine lakes and volcanic lakes) in order to establish the baseline for assessing anthropogenic 's impact: Alpine lakes in the Fagaras Mountains and the volcanic lake Sfanta Ana)
4. Scientific substantiation , conceptual and numerical modeling of aquifer structures for the protection and sustainable use of groundwater in the southern part of Romania
5. Black Sea: limestone nannoplnakton evolution in the last 7,000 years . Paleogeographic and paleoambientale reconstruction.
6. Evaluating the impact of pollutants on the nature of oil and natural degradation of hydrocarbons on aquatic ecosystems

Romanian Navy's Maritime Hydrographic Directorate (DHM)

Significant contribution to the physical oceanography, mainly in the field of bathymetry, have been brought by the Romanian Navy's Maritime Hydrographic Directorate (DHM) whose address is:

1 Fulgerului Street 8700 Constanta, Romania

Tel: +40-41-651 040

Fax: +40-41-513 065

E-mail:dhm@tomrad.ro;

carto@gmb.ro

The structure of the Romanian Maritime Hydrographic Directorate is as follows:

- The Hydrographic Branch;
- The Nautical Cartographic Branch;
- The Oceanography and Meteorology Branch;
- The Maritime Aids to Navigation Branch;
- The Navigation Equipments Maintenance Branch.

MHD operates the hydrographic vessel **"Eugen Stihi"** and the hydrographic launch **"Oltina"** to perform hydrographic and oceanographic surveys.

The Hydrographic Branch

Hydrographic measurements in the littoral area in the harbors area, in the territorial sea and on the continental shelf of the Black Sea.

Processing and deliver hydrographic products for cartographic maps.

Topo Geodesy Laboratory

Cartography of the littoral area. Measurements for vary topo geodesic activities in the harbors and littoral area.

Oceanographic research Laboratory

Geophysical and oceanographical research of the coastal zone and deep sea of the Romanian Part of the Black Sea.

Keeping up to date ad managing the oceanographical data base

Coordinating and organizing research activities with marine ship NMH "Cpt cdor A. Cătuneanu"

Marine Cartography Laboratory

Making and editing of the nautical charts in conformity with the OHI and NATO demands

There are also Maritime signalization and Navigation Safety Laboratory, Marine meteorology Laboratory and the Laboratory for evaluation and analysis.

MAIN OBJECTIVES OF THE ROMANIAN IAPSO SCIENTIFIC RESEARCH

Most of the Romanian geoscientists contributions concerning the physical sciences of the oceans during the past four years has been carried out both within the national program for interdisciplinary scientific research and several international programs financed mainly by the UN, EEC and NATO organizations. The weight of the international co-operation programs on the Romanian scientific research budget was grown each year during the analyzed period.

Although the scientific contribution of the Romanian scientists covers a wide palette of subjects, these may be gathered into the following main topics: the physical sciences of the Geosphere and the physical sciences of the Hydrosphere. Therefore, the classification of research subjects, related to physical sciences of the oceans, included in this brief report will be issued from the above mentioned major topics.

SELECTED REFERENCES

Tiron Duţu, L., Provansal, M., Le Coz, J., Duţu, F., 2014. Contrasted sediment processes and morphological adjustments in three successive cutoff meanders of the Danube Delta. Geomorphology, Volume 204, Pag. 154-164.

Bajo, M., Ferrarin, C., Dinu, I., Umgiesser, G., Stanica, A. 2014. The water circulation near the Danube Delta and the Romanian coast modelled with finite elements, Continental Shelf Research, 78, 62–74.

Adler M-J, S. Chelcea (2014) Climate Change and its Impact in Water management in Romania, Proceedings Danube Conference 2014, XXVI Conference of the Danubian Countries on Hydrological Forecasting and Hydrological Bases of Water Management, 22-24 September 2014, Deggendorf, Germany, pag. 83-89,

Adler M-J (2014)Geodata Base for Danube Flood Hazard and Risk Maps Atlas, Proceedings Danube Conference 2014, XXVI Conference of the Danubian Countries on Hydrological Forecasting and Hydrological Bases of Water Management, 22-24 September 2014, Deggendorf, Germany, pag. 183-187

Adler M-J, R. Macalet, M. Borcan, S Nastasa (2014), „Adaptation to climate change, from source to river basin" Conference, 10-11 November, 2014, Bucharest, ISBN 978-973-O-17800-6

Adler M-J, T. Georgescu, L. Frimescu, S. Nastasa, Al Moldoveanu, I Pasoi, (2014) Flood CBA – Knowledge Platform for Assessing the Costs and Benefits of Flood Prevention Measures, „Adaptation to climate change, from source to river basin" Conference, 1011 November, 2014, Bucharest, ISBN 978-973-O-17800-6

Adler M-J., O. Islam, (2014)" Communication Strategy for the Danube Floodrisk Project – A Flood Protection Story", „Adaptation to climate change, from source to river basin" Conference, 10-11 November, 2014, Bucharest, ISBN 978-973-O-17800-6

Adler M-J., 2014, Danube WATER – a general presentation, „Adaptation to climate change, from source to river basin" Conference, 1011 November, 2014, Bucharest, ISBN 978-973-O-17800-6

Galie Andreea, Marinela Moldoveanu, Daniela Radulescu, River hydro-morphological assessment - Romanian approach, XXVI Conference of the Danubian Countries on Hydrological Forecasting and Hydrological bases of Water Management, 22-24 Septembrie 2014, Deggendorf, Germany

Radulescu Daniela, Andreea Galie, Ileana Tanase, "Assessment the environmental flows using ROEFLOW method", al 10-lea Simpozion Interna țional de Ecohidraulica, 26 -27 iunie 2014, Trondheim, Norvegia

Mic Rodica Paula and Ciprian Corbus (2013), Assessment of the potential impact of climatic change and variability on the flow of Somes river basin, Romania, USGS Proceedings

Voicu Razvan, Ecaterina Luca, Fish Pass Innovations for the Weir of Velenta Bridge from Oradea City", Lakes, reservoirs and ponds, vol. 8(1): 18-27, 2014. ©Romanian Limnogeographical Association.

Voicu Razvan, "Solution to creating a fish migration system over the bottom/discharge sill on the Somesul Mic River near the town of Gherla", Lakes, reservoirs and ponds, vol. 8(2), 2014. ©Romanian Limnogeographical Association.

Tanase Ileana, Daniela Radulescu, Andreea Galie, "The application of some methods for computation the flows for protection of aquatic ecosystems downstream of reservoir", Conferinta "Aerul si apa - Componente ale mediului", Cluj-Napoca, 2014, pag 126-134, ISSN: 2067-743X

Ion Tecuci, Marinela Moldoveanu, "The assessment of hydromorphological status of Romanian rivers, Conferinta „Aerul si apa, componente ale mediului", Editia 2014, 21-22 martie, ClujNapoca, România, p.79-85 (ISSN: 2067-743X)

Voicu Razvan, Ecaterina Luca, Tehnical solutions for ensuring fish migration upstream and downstream the Oradea power plant, 14 th GeoConference on water resources. Forest, Marine and ocean Ecosystems, International Multidisciplinary Scientific Geoconference 17-26 June GEM2014,

Albena, Bulgaria. Conference Proceedings: Section Hydrology and Water Resources, vol. I, pp.691-698, 2014, ISSN 1314-2704, DOI: 10.5593/sgem2014B31.

Razvan Voicu, Ecaterina Luca, Liliana Voicu, „Fish Migration Upstream The Weir Placed Near The Ferdinand Bridge Of Oradea City”, International Conference "Water resources and wetlands", September 11-13, 2014, Tulcea, România.

Nicolae PANIN - Geo-Eco-Marina – Romanian Journal of Marine Earth and Environmental Sciences at Its 20-th Issue, Geo-Eco-Marina - No.20 / 2014

Dan C. JIPA - The Loess-Like Deposits in The Lower Danube Basin. Genetic Significance, Geo-Eco-Marina - No.20 / 2014

Mihaela Muresan - Diversity and Distribution of Free-Living Nematodes within Periazoic Level on The Romanian Shelf of The Black Sea, Geo-Eco-Marina - No.20 / 2014

Francesca DE SERIO, Mouldi BEN MEFTAH, Michele MOSSA -Monitoring and Modelling of Coastal Currents and Wastewater Discharge: a Case Study, Geo-Eco-Marina - No.20 / 2014

Sorin - Corneliu RĂDAN, Silviu RĂDAN, Irina CATIANIS -Relationship Between The Magnetic Susceptibility and Lithological Composition in Sediment Cores from Lakes Of Matiţa - Merhei Depression (Danube Delta, Romania): Towards a Proxy Method of Sedimentological and Environmental Fingerprinting, Geo-Eco-Marina - No.20 / 2014

Dan L. DANIELOPOL, Ricardo L. PINTO, Martin GROSS, Julia da Silva PEREIRA, Nicolett a RIEDL - On The Evolutionary Biology of Elpidium Ostracods (Limnocytheridae, Timiriaseviinae): a Proposal for Pluridisciplinary Studies, Geo-Eco-Marina - No.20 / 2014

Mirela Iuliana ŞUNDRI, Marian - Traian GOMOIU - Zooplankton Features in The Aquatic Area Influenced by Cernavodă Nuclear Power Plant, Geo-Eco-Marina - No.20 / 2014

Alexandru CIORNEI, Izabela MARIŞ, Barbara SOARE - Microfacies Analysis of Cherts in Upper Palaeolithic Sites Along The Lower Danube Valley (Romania) , Geo-Eco-Marina - No.20 / 2014

Dan L. DANIELOPOL - Ostracod Research In Actuality – A Special Issue Of „Crustaceana“, The International Journal Of Crustacean Research, Geo-Eco-Marina - No.20 / 2014

Constantin BONDAR - Book Review - V. A. Ivanov, V.N. Belokopatov – Black Sea Oceanography, Geo-Eco-Marina - No.20 / 2014

Jean-Pierre LEFORT, Guzel DANUKALOVA, Jean - Laurent MONNIER - Why the submerged sealed beaches, last remnants of the low stands of the Upper Pleistocene regression, are better expressed in the Western than in the Eastern English Channel? , Geo-Eco-Marina - No.19 / 2013

Irina DINU, Marco BAJO, Giuliano LORENZETTI, Georg UMGIESSER, Luca ZAGGIA, Gabriela MAXIMOV, Adrian STĂNICĂ - Discussion concerning the current circulation along the Romanian Black Sea coast, Geo-Eco-Marina - No.19 / 2013

Dimcho EVSTATIEV, Yordan EVLOGIEV - Landslides along the northern Black Sea coast between Varna city and Kavarna town (Bulgaria) , Geo-Eco-Marina - No.19 / 2013

Alexandru Vlad LAZĂR, Alexandra Delia BUGHEANU, Gheorghe Viorel UNGUREANU, Alexandru Dan IONESCU - Side-scan sonar mapping of anthropogenically influenced seafloor: A case-study of Mangalia Harbor, Romania, Geo-Eco-Marina - No.19 / 2013

Luigi Enrico CIPRIANI, Enzo PRANZINI , Giovanni VITALE, Lilian WETZEL - Adaptation to beach erosion at Maremma Regional Park (Tuscany, Italy) , Geo-Eco-Marina - No.19 / 2013

Sorin-Corneliu RĂDAN, Silviu RĂDAN, Irina CATIANIS - The use of the magnetic susceptibility record as a proxy signature for the lithological composition of lake sediments: evidences from short cores in the Meşteru - Fortuna depression (Danube Delta), Geo-Eco-Marina - No.19 / 2013

Cristina TABARCEA - New ciliate in the Romanian Black Sea waters - Laboea strobila (protozoa, ciliophora, oligotrichia) , Geo-Eco-Marina - No.19 / 2013

Dan Constatin JIPA, Constantin UNGUREANU and Gabriel ION -Stratigraphy and tectonics of the uppermost Bucegi Conglomerate Formation (Albian, Eastern Carpathians, Romania) , Geo-Eco-Marina - No.19 / 2013

Mihaela C. MELINTE - DOBRINESCU, Gabriel ION - Emiliania huxleyi fluctuation and associated microalgae in superficial sediments of the Romanian Black Sea shelf, Geo-Eco-Marina - No.19 / 2013

Dharmendra MEHTA, Naveen K. MEHTA - Interlinking of Rivers in India: Issues & Challenges , Geo-Eco-Marina - No.19 / 2013

Nicoleta ANIŢĂI - Paleontological Heritage in Dobrogea: Protection, Geoconservation, Education and Promotion , Geo-Eco-Marina - No.19 / 2013

Lorin CONTESCU - 600 milion years of climate change; a critique of the anthropogenic global warming hypotesis from a time-space perspective, Geo-Eco-Marina - No.18 / 2012

Haralambie SAVU - Occurrence of the ocean and its evolution toward an ophiolitic suture , Geo-Eco-Marina - No.18 / 2012

Izabela MARIS - The sedimentology of the Upper Cretaceous continental deposits from the south-western part of the Transylvanian Basin, the Şard Formation , Geo-Eco-Marina - No.18 / 2012

Dan C. JIPA - Coarsening upward sedimentation in the Middle Pontian Dacian Basin, prograding shoreline or delta front? , Geo-Eco-Marina - No.18 / 2012

Andrei BRICEAG, Marius STOICA, Gheorghe OAIE, Mihaela C. MELINTE-DOBRINESCU - Late Holocene microfaunal and nannofloral assemblages of the NW Black Sea , Geo-Eco-Marina - No.18 / 2012

Nicolae PANIN, Willem OVERMARS - The Danube Delta evolution during the Holocene: Reconstruction attempt using geomorphological and geological data and existing cartographic documents , Geo-Eco-Marina - No.18 / 2012

Adrian STANICA, Margarita STANCHEVA, Gheorghe Viorel UNGUREANU, Veselin PEYCHEV, Atanas PALAZOV, Hristo STANCHEV, Florin DUTU - Types and impacts of maritime hydraulic structures on the Romanian – Bulgarian Black Sea coast: setting-up a common catalogue for GIS-based coastline classification , Geo-Eco-Marina - No.18 / 2012

Kateryna UTKINA - Results of ranking land-based hotspots, located within Ukrainian coastal zone , Geo-Eco-Marina - No.18 / 2012

Luminiţa LAZAR, Marian-Traian GOMOIU, Laura BOICENCO, Dan VASILIU - Total Organic Carbon (TOC) of the surface layer sediments covering the seafloor of the Romanian Black Sea coast , Geo-Eco-Marina - No.18 / 2012

Mihaela MUREŞAN - Assessment of free-living marine nematodes community from the NW Romanian Black Sea shelf , Geo-Eco-Marina - No.18 / 2012

Titus BRUSTUR - Reinterpretation of the artiodactyla (Mammalia) footprints described by Ion Popescu-Voiteşti in 1927 , Geo-Eco-Marina - No.18 / 2012

Sorin-Corneliu RADAN - Towards a synopsis of dating the loess from the Romanian Plain and Dobrogea: Authors and methods through time , Geo-Eco-Marina - No.18 / 2012

Jordan MARINSKI, Tania FLOQI, Gergana DROUMEVA, Tania BRANCA, Albena VATRALOVA - Environmental improvement with additional instruments for environmental protection in port areas, Geo-Eco-Marina - No.18 / 2012

Dumitru IOANE, Florina CHITEA - ERT and VES studies for thermo-mineral water in Toplita area, Romania , Geo-Eco-Marina - No.18 / 2012

Nicolae PANIN, Gheorghe OAIE , Adrian STĂNICĂ - The National Institute of Research and Development for Marine Geology and Geoecology – GeoEcoMar: Twenty years of scientific activity , Geo-Eco-Marina - No.18 / 2012

Melinte M.C., Lamolda M. A., (2003) "Correlation of the Coniacian/Santonian boundary interval in Romania and other European areas", London, 56/2, p: 22-34, *Cretaceous Research*

Melinte M.C., Brustur T., Szobotka S., Furtună, C., Pavel A., Şiţaru G., (2003) „Dâmbovicioara-Rucăr-Bran, a Geopark in the heart of the Romanian Carpathians", Bratislava, p: 7-11, *Geologica Carpathica*

Wong H.K., Ludmann T., Baranov B.V., Karp B.Ya., Konerding P., Ion G., (2003) "Bottom current-controlled sedimentation and mass wasting in the northwestern Sea of Okhotsk", 201/2003, *Marine Geology*

Friedrich J., Dinkel Ch., Grieder E., Radan S.;, Secrieru D., Steingruber S.,Wehrli B., (2003) "Nutrient uptake and benthic regeneration in Danube Delta Lakes", 64, p: 373-398, *Biogeochemistry*

Seghedi A., Oaie Gh., Maruntiu M., Iancu V., (2003) "Late Proterozoic-Early Cambrian Terranes in the Basement of Moesia and Surrounding Alpine Belts", Abstracts with Programs, Cordilleran Section, vol. 35, nr. 4, p. 11, *Geological Society of America Convention*

Melinte M.C. (2003) " Is the deposition of the CORB related to biostratigraphical significant changes?", Volume of abtracts, p: 26-28, *Meeting of the IGCP463 (Upper Cretaceous Oceanic Red Beds), Bartin –Turkey*

Bondar C., Sava C., (2003) "An enhanced monitoring methodology of the riverbed morphological changes, applied on the lower course of the Danube River", Abstract, *XXII I.U.G.G. General Assembly, Sapporo, Japan*

Dimitriu R.G., Seghedi A., (2003) "Western Black Sea shear margin: Regional tectonics as inferred from geological modeling", *Workshop on „Tectonic events and evolution of the Black Sea", MEBE Programme, Kiev, U-kraine, February 18-25, 2003*

Dimitriu R.G., Seghedi A. Oaie Gh., Ioane D., (2003) "Deep structure of the foreland in the East Carpathian bend zone and the geological evolution of the Danube Delta basement", *Workshop on „Tectonic events and evolution of the Black Sea", MEBE Programme, Kiev, U-kraine, February 18-25, 2003*

Lamolda M.A., Melinte M.C., Kunio K., (2004) "Extinction and survivorship across the K/T Boundary of Caravaca (SW Spain)", v. 44., *Palaeogeography, Palaeoclimatology, Palaeoecology*

Melinte M.C., Jipa D., (2004) „Uppermost Cretaceous pelagic/hemipelagic red beds in the Bend Area of the Romanian Carpathians”, vol. 20, *Cretaceous Research*

Stanica A., Feas J., (2004) „Present evolution and future predictions for the Black Sea coastal zone between the Sulina and Sf. Gheorghe Danube River mouths (Danube Delta). A theoretical view of sustainable shoreline management issues.”, *Ocean & Coastal Management*

Papanikolaou, D., Barghati, H., Dabovski, C., Dimitriu, R.G., EL-HAWAT H., Ioane D., Kranis H., Obeidi A., Oaie Gh., Seghedi A., Zagorchev, I., (2004) “The TransMed Atlas: The Mediterranean Region from Crust to Mantle - Transect VII: East European Craton – Scythian Platform – Dobrogea – Balkanides – Rhodope Massif – Hellenides – East Mediterranean – Cyrenaica. (Editors: Cavazza, W., Roure, F., Spakman, W., Stampfli, G.M., Ziegler, A.), p: 114-119, CD-ROM, *Springer – Verlag (Berlin, Heidelberg)*

Starostenko V., Buryanov V., Makarenko I., Rusakov O., Stephenson R., Nikishin A., Georgiev G., Gerasimov M., Dimitriu R., Legostaeva O., Pchelarov, V., Sava C., (2004) “Topography of the crust-mantle boundary beneath the Black Sea basin”, v. 381, n. 1-4, p. 211-233, Tectonophysics

Seghedi A., Oaie Gh., Dimitriu R., (2004) “The TRANSMED Atlas – The Mediterranean Region from crust to mantle. Geological and geophysical framework of the Mediterranean and the surrounding areas – Transect VII – East European Craton – Dobrogea – Cyrenaica”, *Springer – Verlag (Berlin, Heidelberg)*

Popescu I., Lericolais G., Panin N., Normand A., Dinu C., LeDrezen E., (2004) “The Danube subaqueous canyon (Black Sea): morphology and sedimentary processes”, v. 206 (1-4), p: 249-265, *Marine Geology*

Seghedi A., Stephenson R.A., Neaga V., Dimitriu R., Ioane D., Stovba S., (2004) “The Scythian Platform north of Dobrogea (Romania, Moldova and Ukraine), *Tectonics*

Bondar C. Sava C., (2004) “Enhanced Monitoring Methodology of the Riverbed Morphological Changesapplied on the Lower Course of the Danube River”, *XXII-th IUGG.General Assembly, Sapporo, Japan*

Seghedi A., Oaie Gh., Vaida M., Debacker T. N., Sintubin M., (2004) “Paleozoic formations in North Dobrogea: sedimentation, deformation and metamorphism”, p: 1 – 3, *Avalonia – Moesia Symposyum & Workshop, Ghent (Belgium)*

Oaie Gh., Seghedi A., Radan S., Vaida M., (2004) „Sedimentology and source areas for the Neoproterozoic - Lower Cambrian turbidites from East Moesia”, p: 23 – 24, *Avalonia – Moesia Symposyum & Workshop, Ghent (Belgium)*

Rădan S.C., Rădan S., (2004) “Magnetic susceptibility identification of environmental impact of the anthropogenic activities in aquatic ecosystems. A case study in the Danube Delta (Romania)”, vol. 34, Special issue, p: 114 –116, *9th Castle Meeting, Palaeo, Rock and Environmental Magnetism, Tatranská Javorina, Slovak Republic, June 27 – July 3, 2004, Contributions to Geophysics and Geodesy*

Rădan S.C., Rădan S., Oaie Gh., Szobotka Ş., (2004) ”Magnetic susceptibility as a sensitive proxy parameter for differentiating deltaic (lacustrine and fluvial) sedimentary environments; inferences from the Danube Delta (Romania)” “, vol. 34, Special issue, p: 117 – 119, *9th Castle Meeting, Palaeo, Rock and Environmental Magnetism, Tatranská Javorina, Slovak Republic, June 27 – July 3, 2004, Contributions to Geophysics and Geodesy*

Secrieru, D., Gulin, S., Osvath, I., (2004) ”Chronology of Metal Pollution Offshore Coruh Mouth, Eastern

Black Sea", poster, *Aquatic Forum 2004, Monaco*

Gallemi J., Melinte M.C. (2004) "Echinoid levels and ages of Betic Cordilleraa (S and SE Spain)", Volume of abstracts, p: 12-13, *Meeting of the Spanish Palaeontological Society, Granada 2004*

Lamolda M., Melinte M.C., Wan X., (2004) "Integrated micropaleontological study of the Chuangde section, Southern Tibet", Volume of Abstracts, p: 6-9, *Symposium of the Geology of Asia, Hanoi*

Oaie Gh., (2004) "Romanian Marine RT&D priorities", poster, *Galway (Ireland)*

Panin N., (2004) "Euro-EcoGeoCentre Romania", Abstract book, p: 116-117, *EUROCEAN 2004, European Conference, Marine Science & Ocean Technology, Galway, Ireland, May 10-13*

Lericolais G, Popescu I., Panin N., Guichard F., (2004) "Questions on the sea level fluctuations in the Black Sea since the Last Glacial Maximum ASSEMBLAGE Project", p. 123, *Fourth International Congress on Environmental Micropalaeontology, Microbiology and Meiobenthology, Program and Extended Abstracts (September 13-18, 2004, Isparta, Turkey), V. Yanko-Hombach, M. Görmüs, A. Ertunç, M. McGann, R. Martin, J. Jacob and S. Ishman eds.*

Stanica A., Bonardi M., (2004) "Proposal for a sustainable shoreline management", TR ISMAR-Ve No. 126/2004, p. 17, *Proceedings of the China-Italy Bilateral Seminar on Monitoring and management of coastal areas in relation to natural and man induced environment impact, climate change and mean sea level variations, June 28- July 2, 2004, Qingdao (China)*

Stanica A., Bonardi M., (2004) "Identification of most acceptable methods for the environmental rehabilitation of the Guanabara Bay (Brasil)", TR ISMAR-Ve No. 126/2004, p: 55-56, *Proceedings of the China-Italy Bilateral Seminar on Monitoring and management of coastal areas in relation to natural and man induced environment impact, climate change and mean sea level variations, June 28- July 2, 2004, Qingdao (China)*

Radan S., (2004) „Emissions de gaz à effet de serre dans le Delta du Danube", *Les séminares de l'UMR 6143 à CAEN – Institut de Morphodynamique continentale et cotière, Caen France, 17 Mars 2004*

Radan S., (2004) „Le géosystème hydrosédimentaire Danube – Delta du Danube – Mer Noire. Genèse, évolution, influences anthropique", *Conférence à l'Université de Perpignan – Laboratoire d'Etude des Géo-Environnements Marins, 22 Mars 2004*

Radan S., (2004) „Sédimentation argileuse actuelle dans le hydrosystème Danube – Delta du Danube – Mer Noire", *Conférence à l'Université de Perpignan – Laboratoire d'Etude des Géo-Environnements Marins, 23 Mars 2004*

Radan S., (2004) „Delta du Danube – impact des apports fluviatiles sur l'évolution des écosystèmes aquatiques. Évaluation des influences sur la qualité des milieux aquatiques sédimentaires et biologiques", *Conférence à l'Université de Perpignan – Laboratoire d'Etude des Géo-Environnements Marins, 30 Mars 2004*

Radan S., (2004) „Emissions de gaz à effet de serre dans le Delta du Danube", *Conférence à l'Université de Perpignan – Laboratoire d'Etude des Géo-Environnements Marins, 31 Mars 2004*

Stoica M., Ungureanu V.Gh., Radan S., (2004) „Fossils response to paleoenvironmental change in Danube Delta", *Varna Workshop, 23 - 26 October 2004, Varna, Bulgaria*

Strechie C., Fontugne M., Guichard F., (2004) „Carbon Isotope Ratio in Black Sea Sediments: Geochemical and Geochronological Aspects", *Varna Workshop, 23 - 26 October 2004, Varna, Bulgaria*

Jelinowska, A. Louchet, Strechie C., Meynadier L., Guichard F., Tucholka P., (2004) "Magnetic properties of NW Black Sea sediments : results of BLASON II cruise", *Varna Workshop, 23 - 26 October 2004, Varna, Bulgaria*

Secrieru D., Gulin S., Osvath I., (2004) "Chronology of Metal Pollution Offshore Coruh Mouth, Eastern Black Sea", p: 608-609, *Book of Extended Synopses, International Conference on Isotopes in Environmental Studies - Aquatic Forum 2004. IAEA-CN-118, Vienna*

Bondar C., (2004) "The state and tendency of the hydromorphological processes of the Danube and Danube Delta", Volume of Abstracts, *Euro-EcoGeoCentre – Romania – Workshop 1: "Environmental problems of the Lower Danube, including the Danube Delta, and new ideas for an Integrated Observing and Forecasting System in the Lower Danube, Danube Delta and the Black Sea", Bucharest, 19 - 22 January 2004*

Dimitriu R., (2004) "An integrated geo-ecological study of the Razelm-Sinoe Lagoon System", Volume of Abstracts, *Euro-EcoGeoCentre – Romania – Workshop 1 – "Environmental problems of the Lower Danube, including the Danube Delta, and new ideas for an Integrated Observing and Forecasting System in the Lower Danube, Danube Delta and the Black Sea", Bucharest, 19 - 22 January 2004*

Oaie Gh., (2004) „General presentation of the main issues regarding the sustainable management of the Danube River", Abstracts volume, *Euro-EcoGeoCentre – Romania – Workshop 1: "Environmental problems of the Lower Danube, including the Danube Delta, and new ideas for an Integrated Observing and Forecasting System in the Lower Danube, Danube Delta and the Black Sea", Bucharest, 19-22 January 2004*

Rădan S., (2004) „The evolution of clay mineral associations in the sediments of the Danube – Danube Delta – Black Sea geosystem", Abstracts volume, *Euro-EcoGeoCentre – Romania – Workshop 1 – "Environmental problems of the Lower Danube, including the Danube Delta, and new ideas for an Integrated Observing and Forecasting System in the Lower Danube, Danube Delta and the Black Sea", Bucharest, 19 - 22 January 2004*

Szobotka Ş., (2004) "Bathymetrical and sedimentological research along the Romanian section of the Danube River", Abstracts volume, *Euro-EcoGeoCentre – Romania – Workshop 1 – "Environmental problems of the Lower Danube, including the Danube Delta and new ideas for an Integrated Observing and Forecasting System in the Lower Danube, Danube Delta and the Black Sea", Bucharest, 19 - 22 January 2004*

Secrieru, D., Oaie Gh., (2004) "Geochemical and sedimentological characteristics of the NW Black Sea Shelf". Abstracts volume, *Euro-EcoGeoCentre – Romania – Symposium 1: "The Pollutant Influxes into the semi-enclosed marine basins – Comparison between the European River–Seas Systems of the Baltic Sea, the Mediterranean Sea and Black Sea", Bucharest, 22-24 April 2004*

Dincă, D., Stobie, V., Zaharia, D., Secrieru D., Gomoiu, M.T., (2004) „Some results of the studies carried out on the effect of thermal discharge from NPP Cernavoda on the Danube River ecosystem – zone of influence", Volume of Abstracts, *Euro-EcoGeoCentre – Romania – Symposium 1: "The Pollutant Influxes into the semi-enclosed marine basins – Comparison between the European River–Seas Systems of the Baltic Sea, the Mediterranean Sea and Black Sea", Bucharest, 22-24 April 2004*

Bondar C., Sava C., (2004) "Study on morphological changes in a riverbed pilot reach of the Lower Danube", Volume of Abstracts, *EuroEcoGeoCentre –Romania Symposium 1: "The Pollutant*

Influxes into the semi-enclosed marine basins – Comparison between the European River–Seas Systems of the Baltic Sea, the Mediterranean Sea and Black Sea", Bucharest, 22-24 April 2004

Panin N., Bondar C., Jipa D., (2004) „The River Danube – Black Sea Geosystem. Birth and development. Hydrologic and sedimentologic characteristics", Abstracts volume, *Euro-EcoGeoCentre – Romania – Symposium 1: "The Pollutant Influxes into the semi-enclosed marine basins – Comparison between the European River–Seas Systems of the Baltic Sea, the Mediterranean Sea and Black Sea", Bucharest, 22-24 April 2004*

Rădan S., Ganciu A., Strechie C., Grosu A., Berghes F., Rădan S.C., Secrieru D., Bălan S., Grosu D, (2004) „Trends in Pollutant Inflow and Dispersal in Danube Delta – Effects on Aquatic Ecosystem Quality", Abstracts volume, *Euro-EcoGeoCentre – Romania – Symposium 1: "The Pollutant Influxes into the semi-enclosed marine basins – Comparison between the European River–Seas Systems of the Baltic Sea, the Mediterranean Sea and Black Sea", Bucharest, 22-24 April 2004*

Ungureanu V., Stanica A., Dan S., Panin N., Maximov G., Simescu D., Bondar C., (2004) "Mamaia Bay - Morphodynamics and possible solutions against erosional phenomena", *Euro-EcoGeoCentre – Romania – Symposium 1: "The Pollutant Influxes into the semi-enclosed marine basins – Comparison between the European River–Seas Systems of the Baltic Sea, the Mediterranean Sea and Black Sea", Bucharest, 22-24 April 2004*

Ungureanu V., Stanica A., Dan S., Panin N., Maximov G., Simescu D., Bondar C., (2004) "Researches regarding the beaches from the southern part of the romanian littoral – South of Constanta Harbor", *Euro-EcoGeoCentre – Romania – Symposium 1: "The Pollutant Influxes into the semi-enclosed marine basins – Comparison between the European River–Seas Systems of the Baltic Sea, the Mediterranean Sea and Black Sea", Bucharest, 22-24 April 2004*

Angheluţă C., Jipa D., (2004) "Environmental risk assessment from hydrocarbon contamination in the coastal zone: Case study – OIL Terminal S.A. – Constanţa Area", Volume of Abstracts, *Euro-EcoGeoCentre – Romania– Workshop 2 – "Environmental disequilibria in the NW Black Sea coastal system: causes, consequences, correctives", Danube Delta, 25-29 August 2004*

Bondar C., (2004) „The possible influence of the Bystroe Canal on the Danube Delta hydrology", Abstracts volume, *Euro-EcoGeoCentre – Romania – Workshop 2 – "Environmental disequilibria in the NW Black Sea coastal system: causes, consequences, correctives", Danube Delta, 25-29 August 2004*

Panin N., Bondar C., Stănică A., Dan S., (2004) "The Danube Delta and the coastal zone-Evolution and environmental changes", Abstracts volume, *Euro-EcoGeoCentre – Romania – Workshop 2 – "Environmental disequilibria in the NW Black Sea coastal system: causes, consequences, correctives", Danube Delta, 25-29 August 2004*

Melinte M.C., Jipa, D.C. (2005) "Campanian-Maastrictian marine red beds in Romania: biostratigraphic and genetic significance." Elsevier, Oxford, G.B, vol 26/1 p: 49-56., *Cretaceous Research*

Iovea M., Oaie Gh., Ricman C., Mateiasi G., Neagu M., Szobotka S., Duliu O.G., (2005) "Dual energy X-ray computer axial tomography and digital radiography investigation of cores and other objects of geological interest", p. 14, *Springer – Environmental Geology*

Lamolda, M.A., Melinte M.C., Kaiho, K., (2005) "Nannofloral extinction and survivorship across the K/T boundary at Caravaca, southeastern Spain", London, 224 (1-3), p: 27-52, *Palaeogeography, Palaeoclimatology, Palaeoecology*

Clauzon, G., Suc. J-P., Popescu, S.-M., Mărunţeanu, M. Rubino, J.-L., Marinescu. F, Melinte M.C., (2005) "Influence of the Mediterranean sea-level changes on the Dacic Basin (Eastern Paratethys) during the Late Neogene: the Mediterranean Lago Mare Facies deciphered", 17 (3), p: 437-462, *Basin Research*

Popescu I, Lericolais G, Panin N, Normand A, Dinu C, Le Drezen E., (2005) "The Danube Submarine Canyon (Black Sea): morphology and sedimentary processes", 206 (1-4), p: 249-65, *Marine Geology*

Oaie Gh., Seghedi A., Radan S., Vaida M., (2005) "Sedimentology and source areas for the Neoproterozoic-Lower Cambrian turbidites from East Moesia",vol. 8, nr. 4, p: 78-98, *Geologica Belgica*

Seghedi A., Berza T., Iancu V., Maruntiu M., Oaie Gh., (2005) "Neoproterozoic terranes in the Moesian basement and in the Alpine Danubian nappes of the South Carpathians", vol. 8, nr. 4, p: 4-19, *Geologica Belgica*

Gomoiu M.T., (2005) "Non-indigenous species in the Romanian Black Sea litoral zone: *Mya arenaria, Rapana venosa* and others", p: 163 – 183, *"NEAR curriculum in natural environmental sciences" Editors: Janusz Dominik et al.*

Gomoiu M.T., (2005) "New approaches in the assesment of the Black Sea ecosystems", p: 20 – 26, EC/Joint Research Centre /Black Sea Commission/ Helsinki Commission, Joint Workshop on *Marine Assessment and Monitoring with emphasis on eutrophication, Istanbul - Outcome of the Joint EC-JRC / HELCOM / BSC Workshop. HELCOM DPS in folder: MONAS / EC-JRC HELCOM BSC Workshop.*

Strechie C., Jelinowska A, Colin C, Guichard F, Tucholka P,Fontugne M, Lericolais G, Panin N., (2005) „Tracing Black Sea level since the Last Glacial Maximum", p. 352, *32-nd International Geological Congress, Florence (Italy)*

Oaie Gh., Secrieru D., (2005) "Sedimentological and geochemical characteristics of the Danube Delta front and Danube prodelta", *32-nd International Geological Congress, Florence (Italy)*

Seghedi A., Oaie Gh., (2005) "Neoproterozoic evolution of the Moesian crust", Abstract CD ROM, *32-nd International Geological Congress, Florence (Italy)*

Scott R., Hu X., Malata E., Melinte M.C., Scherbinina E., Wagrecih M., (2005) "Timing and rates of deposition of Cretaceous Oceanic Beds", *32-nd International Geological Congress, Florence (Italy)*

Melinte M.C., Jipa D. (2005) "Arid and humid climates during the Cenomanian-Maastrichtian interval in the Romanian Carpathians", *32-nd International Geological Congress, Florence (Italy)*

Lericolais G, Popescu I, Panin N, Guichard F., (2005) "Questions on the sea level fluctuations in the Black Sea since the Last Glacial Maximum ASSEMBLAGE Project", *International Symposium on Earth System, Istanbul (Turkey); In: Alemdaroglu K, Barla MC, Mater B, editors*

Popescu I, Lericolais G, De Batist M, Panin N., (2005) "Submarine Canyon Evolution and Controls in the NW Black Sea: Evidence from the Danube Canyon", *International Symposium on Earth System, Istanbul (Turkey); In: Alemdaroglu K, Barla MC, Mater B, editors*

Iovea M., Oaie Gh., Duliu O.G., Bodale M., Mateiasi G. , Neagu M., (2005) "Single and dual-energy X-ray computer tomography and digital radiography study of sedimentary cores", *MEDCOAST 05, Kuşadasi ,Turkey*

Melinte M.C., Bojar A. V. (2005) "Biostratigraphical and biogeochemical signals: proxies for the generation of anoxic oceanic events", *The 7th International Cretaceous Symposium, Neuchâtel*

Melinte M.C., Lamolda M. A., Kaiho K., Bernandez E. (2005) "The Response of the Calcareous Nannofossils at the Oceanic Anoxic Event 2 (OAE2) in the Arobes section, N. Spain", *The 7th International Cretaceous Symposium, Neuchâtel*

Melinte, M.C., Bubik, M. (2005) "Paleoceanographic significance of Upper Cretaceous red bed sediments. Case Study: the Eastern Carpathians", *The 7th International Cretaceous Symposium, Neuchâtel*

Barbu V., Melinte M.C. (2005) "Late Valanginian Anoxic Event in the Bucegi Mountains area (Romania)", *The 7th International Cretaceous Symposium, Neuchâtel*

Melinte M.C. (2005) "Calcareous nannofloral character from the Romanian Black Sea cretaceous onshore and offshore sediments" , Volume of Abstracts, p. 76, *In Nakoman et al. (eds.), International Earth Science Colloquium on Aegean Regions, Izmir, Turkey, October 4-7, 2005*

Melinte M.C., Popescu, S.-M., Suc, J.-P., Clauzon, G., Çatagay, N. (2005) " Messinian-Zanclean nannofloras from the Aegean Region Intepe Section (NW Turkey)", Volume of Abstracts, p. 77, *In Nakoman et al. (eds.), International Earth Science Colloquium on Aegean Regions, Izmir, Turkey, October 4-7, 2005*

Oaie Gh., Melinte M.C. (2005) "Upper Holocene sedimentation in the NW and SE Black Sea Basin", Volume of Abstracts, p. 87-88, *In Nakoman et al. (eds.), International Earth Science Colloquium on Aegean Regions, Izmir, Turkey, October 4-7, 2005*

Seghedi A., Oaie Gh., Vaida M., (2005) "Paleozoic evolution of the Moesian Platform (Romania) – an overview", Volume of Abstracts, p: 106-107, *In Nakoman et al. (eds.), International Earth Science Colloquium on Aegean Regions, Izmir, Turkey, October 4-7, 2005*

Oaie Gh., Florescu S., (2005) "R/V Mare Nigrum – New equipments on-board", Lisbon (Portugal), *European Research Vessels Operators (ERVO)*

Oaie Gh., (2005) "Environmental Sciences and Policy for the Future – Romanian position for the FP 7", *EU Meeting Bratislava (Slovakia)*

Ioane D., Oaie Gh., (2005) "Mining activities in Rosia Montana (Romania) in the Roman times", *COST – Action 27, Napoli (Italy)*

Bondar C., (2005) "Variations in the Black Sea level due to river-sea interactions", Volume of Abstracts, p. 4, *Euro-EcoGeoCentre International symposium "Semi-enclosed European Seas-Interactions between Major Compartments" April 08-10, 2005, Snagov*

Gomoiu M.T., (2005) "State of biotic communities at NW Black Sea sediment-water interface", Volume of Abstracts, p. 9, *Euro-EcoGeoCentre International symposium "Semi-enclosed European Seas-Interactions between Major Compartments" April 08-10, 2005, Snagov*

Melinte M.C., (2005) "Mesozoic-Cenozoic Paleoclimatic changes revealed by calcareous nannofloras of the Romanian Black Sea onshore and offshore", Volume of Abstracts, p. 18, *Euro-EcoGeoCentre International symposium "Semi-enclosed European Seas-Interactions between Major Compartments" April 08-10, 2005, Snagov*

Radan S., Klaver G., Ganciu A., (2005) "Danube Delta – a Wetland source of greenhouse gases: Natural trends and anthropogenic influences", Volume of Abstracts, p: 30-32, *Euro-EcoGeoCentre*

International symposium "Semi-enclosed European Seas-Interactions between Major Compartments" April 08-10, 2005, Snagov

Radan S. C., Radan S., (2005) "Environmental magnetic studies in the Danube Delta: Evidences of natural changes and anthropogenic pressure on sedimentary processes", Volume of Abstracts, p: 26-29, *Euro-EcoGeoCentre International symposium "Semi-enclosed European Seas-Interactions between Major Compartments" April 08-10, 2005, Snagov*

Oaie Gh., Secrieru D., Szobotka St., Fulga C., Stanica A., (2005) "Danube River: sedimentology, mineralogical and geochemical characteristics of the bottom sediments", Volume of Abstracts, p: 19-21, *Euro-EcoGeoCentre International symposium "Semi-enclosed European Seas-Interactions between Major Compartments" April 08-10, 2005, Snagov*

Ungureanu V., Panin N., Stanica A., Bondar C., Simescu D., Dan S., Maximov G., (2005) "Mamaia Bay-Morphodynamics and Possible Solutions against Erosional Phenomena", Volume of Abstracts, p: 34-35, *Euro-EcoGeoCentre International symposium "Semi-enclosed European Seas-Interactions between Major Compartments" April 08-10, 2005, Bucharest*

Simescu D., Stanica A., Panin N., Bondar C., Dan S., Maximov G., Simbotin A., Diaconeasa D., Ungureanu V., (2005) "Researches regarding Romanian Littoral Beaches at South of Constantza Port, carried out in the Frame of the MENER Program", Volume of Abstracts, p. 33, *Euro-EcoGeoCentre International symposium "Semi-enclosed European Seas-Interactions between Major Compartments" April 08-10, 2005, Bucharest*

Olteanu, R., Jipa, D., (2005) "Dacian semi-inclosed Paratethyan basin. Environmental evolution during the Upper Neogene", Volume of Abstracts, p. 15, *Euro-EcoGeoCentre International symposium "Semi-enclosed European Seas-Interactions between Major Compartments" April 08-10, 2005, Bucharest*

Olariu C., Ungureanu G.V., Stanica A., (2005) "Variation of the Sf. Gheorghe river effluent plume using remote sensing, Danube Delta - Black Sea", *4th Congress of the Balkan Geophysical Society "RSG-BGS / EAGE & SEG / EGU & AGU Bucharest 2005" October, 2005, Bucharest*

Jipa, D., Olteanu, R., (2005) "Birth development and closure of the Dacian Basin (Upper Neogene, Romania)", Conference volume, Supplement to Jour, Balkan Geophys. Soc. vol. 8 p. 72-75, *4th Congress of the Balkan Geophysical Society, 2005, Bucharest*

Opreanu P., (2005) "Preliminary data concerning some quantitative and qualitative changes in the Ostracoda (Crustacea) populations in the north-western Black Sea", Volume of abstracts , p. 13, *Euro-EcoGeoCentre Workshop "Change in the structure and functioning of the open sea ecosystems", October 27-29, 2005, Snagov*

Gomoiu M. T., Secrieru D., Oaie Gh., Opreanu P., Paraschiv G.M., Begun T., Teaca A., Sosnovschi E., (2005) "GeoEcoMar contributions to the understanding of the NW Black Sea Ecosystems", Volume of abstracts, p. 7, *Euro-EcoGeoCentre Workshop "Change in the structure and functioning of the open sea ecosystems", October 27-29, 2005, Snagov*

Banaru D., Harmelin-Vivien M., Gomoiu M.T., (2005) „Use of stable isotopes signature (δ13C & δ15N) of water, sediment and some organism from the Black Sea Danubian Area – New approach for understanding the influence of terrestrial discharge upon the marine ecosystem", Volume of abstracts, p. 3, *Euro-EcoGeoCentre Workshop "Change in the structure and functioning of the open sea ecosystems", October 27-29, 2005, Snagov*

Bondar C. (2005) "On water and salinity paleobalance of the Black Sea Basin", Volume of abstracts, p. 4, *Euro-EcoGeoCentre Workshop "Change in the structure and functioning of the open sea ecosystems", October 27-29, 2005, Snagov*

Ion G., Ion E., (2005) „Gas hydrates and fluids – factors in the evolution of sedimentary structures", Volume of abstracts, p. 8, *Euro-EcoGeoCentre Workshop "Change in the structure and functioning of the open sea ecosystems", October 27-29, 2005, Snagov*

Jipa D., Panin N., (2005) „Mechanisms of sandy sediment accumulation in the Black Sea Abyssal Zone (Quaternary)", Volume of abstracts, p. 10, *Euro-EcoGeoCentre Workshop "Change in the structure and functioning of the open sea ecosystems", October 27-29, 2005, Snagov*

Melinte M.C., (2005) „Biological response of calcareous nannoplankton to climatic changes and sea-level fluctuations", Volume of abstracts, p. 11, *Euro-EcoGeoCentre Workshop "Change in the structure and functioning of the open sea ecosystems", October 27-29, 2005, Snagov*

Melinte M.C., Suc J.-P., Clauzon G., Cagatay N., Popescu S., (2005) „Changes in the functioning of marine ecosystems. Case study: The Messinian-Zanclean of NW Turkey", Volume of abstracts, p. 12, *Euro-EcoGeoCentre Workshop "Change in the structure and functioning of the open sea ecosystems", October 27-29, 2005, Snagov*

Panin N., Strechie C., (2005) „The Black Sea development and consequent environmental changes in the last ~ 100.000 years", Volume of abstracts, p. 14, *Euro-EcoGeoCentre Workshop "Change in the structure and functioning of the open sea ecosystems", October 27-29, 2005, Snagov*

Jipa D., Olteanu R., (2005) „Dacian Basin during Sarmatian time: open sea or marine bay?", Volume of abstracts, p.9, *Euro-EcoGeoCentre Workshop "Change in the structure and functioning of the open sea ecosystems", October 27-29, 2005, Snagov*

Gomoiu M.T., (2005) "Fascination of shells, fascination of snails. Conchology – malacology at the Black Sea", Abstracts volume, *International Congress of Malacology, Sibiu*

Gomoiu M.T., Begun T., Paraschiv G., Opreanu P., Sosnovschi E., (2005) "Contributions to the knowledge of the Mollusk populations in the Razelm - Sinoe lagoonal complex", Abstracts volume, *International Congress of Malacology, Sibiu*

Teaca A., Gomoiu M.T., (2005) "Contributions to the knowledge of the mollusk populations on the shallow hard bottom of the Romanian Black Sea Coast", p: 72-75, *International Congress of Malacology, Sibiu*

Jugaru, L., Provansal, M., Panin, N., Dussouillez, P., 2006. Apports des Systemes d'Information Geographiques a la perception des changements morphodynamiques (1970-2000) dans le delta du Danube. Le cas du bras de Saint-George. GEO-ECO-MARINA, 12 : 29-42.

Melinte M.C., (2007) "Latest Jurassic to Earliest Cretaceous Paleoenvironmental Changes in the Southern Carpathians (Romania): Regional Record of the Late Valanginian Nutrification Event" *(in press), London, Cretaceous Research*

Melinte M.C., (2007) Bojar. A.-V., "Biostratigraphic and isotopic record of the Cenomanian-Turonian deposits in the Ohaba-Ponor section (SW Haţeg, Romania)" *(in press), London, Cretaceous Research*

Melinte M.C., (2007) Lamolda M., "Coniacian-Santonian boundary in Romania and comparison with other European areas", 56, *(in press), London, Cretaceous Research*

Melinte M.C., Lamolda M., (2007) “Calcareous nannofossil biostratigraphy of the Coniacian/Santonian boundary interval in Romania and comparison with other European regions”, *(in press), London, Cretaceous Research*

Popescu M.S., Melinte M.C., Suc J.-P., Clauzon G., Quillevéré F., Sütö-Szentai M., (2007) “Earliest Zanclean age for the Colombacci and uppermost Di Tetto formations of the “latest Messinian”northern Apennines: New palaeoenvironmental data from the Maccarone section (Marche Province, Italy)” *(in press), Géobios*

Duque-Bolero, F., Maurrasse, F., Melinte M.C., (2007) "Cyclic sedimentation from the Cenomanian/Turonian of NE Mexico: its relationship to Milankovitch and solar cycles” *(in press), London, Earth and Planetary Science Letters*

Panin N., Popescu I., (2007) “Research in the Western Sector. The northwestern Black Sea: climatic and sea-level changes in the Late Quaternary”, p: 387-404, *“The Black Sea Flood Question: Changes in Coastline, Climate and Human Settlement”, Ed. by Valentina Yanko-Hombach, Allan S. Gilbert, Nicolae Panin, Pavel M. Dolukhanov, Published by Springer, P.O. Box 17, 3300 AA Dordrecht, The Netherlands*

Dan, S., Stive, M.J.F., Walstra, D.J.R., Panin, N., 2009. Wave climate, coastal sediment budget and shoreline changes for the Danube Delta. Marine Geology, 262 (1-4): 39-49.

Jugaru Tiron, L., Le Coz, J., Provansal, M., Panin, N., Raccasi, G., Dramais, G., Dussouillez, 2009. Flow and sediment processes in a cutoff meander of the Danube Delta during episodic flooding. Geomorphology, 106 (3-4): 186-197.

Stănică, A., Panin, N., 2009. Present evolution and future predictions for the deltaic coastal zone between the Sulina and Sf. Gheorghe Danube river mouths (Romania). Geomorphology, 107, (1-2): 41-46.

Dan S., Walstra D-J. R., Stive M.J. F., Panin N., 2011. Processes controlling the development of a river mouth spit. Marine Geology; 280(1):116-129.

Kuroki K., Goda Y., Panin N., Stanica A., Diaconeasa D. I., Babu G., 2006. Beach Erosion and Coastal Protection Plan along the Sothern Romanian Sea Shore. “Coastal Engineering 2006” (Proceedings of the 30th International Conference, San Diego, California, USA, 3-8 September 2006)

Panin, N., 2011. The Danube Delta – the Mid Term of the Geo-system Danube River – Danube Delta – Black Sea. Geological Setting, Sedimentology and Holocene to Present-Day Evolution. *Académie Roumaine - Rev. Roum. Géologie*, 55: 41–82, Bucureşti.

Yanko-Hombach Valentina, Panin N., Filipova-Marinova Mariana, Catto N., (Eds) 2012. IGCP 521: Caspian – Black Sea – Mediterranean Corridors during the last 30 ka: sea level change and human adaptive strategies. *Quaternary International - Volume 261*, pp182, Elsevier Ltd.

Lericolais, G., Bourget, J., Popescu, I., Jermannaud, P., Mulder, T., Jorry, S., Panin, N., 2012. Late Quaternary deep-sea sedimentation in the western Black Sea: New insights from recent coring and seismic data in the deep basin, *Global and Planetary Change*, 53 pp.

Panin, N., Overmars, W., 2012. The Danube Delta evolution during the Holocene: Reconstruction attempt using geomorphological and geological data, and some of the existing cartographic documents. *Geo-Eco-Marina, 18*: 75 – 104, Bucuresti.

IASPEI ACTIVITIES IN ROMANIA

2011-2014

NATIONAL REPORT IN SEISMOLOGY AND PHYSICS OF THE EARTH'S INTERIOR

IASPEI ACTIVITIES IN ROMANIA
2011-2014

Romanian IASPEI Committee

Presidents/National Correspondents:
Dr. Mircea Radulian [1)] mircea@infp.ro

Members:
Dr. Luminita Angela Ardeleanu[1)] ardel@infp.ro
Dr. Horea Sandi[2)] sandi@geodin.ro
Dr. Venera Dobrica[2)] venera@geodin.ro

Secretary:
Dr. Iren-Adelina Moldovan [1)] iren@infp.ro

1) National Institute for Earth Physics
12, Calugareni Street, P.O. Box MG-2, RO-077125
Magurele, Ilfov, Romania
Tel: +40-21-4050670; Fax: +40-21-4050673

2) Institute of Geodynamics "Sabba S. Stefanescu"
19-21 Jean-Louis Calderon, RO- 020032
Bucharest 37, Romania
Tel: +40-21-317 21 26; Fax: +40-21-317 21 20

Involved Institutions

National Institute for Earth Physics
Institute of Geodynamics "Sabba S. Stefanescu"
University of Bucharest, Faculty of Geology and Geophysics
University of Bucharest, Faculty of Physics

FOREWORD

The present report describes the activities carried out in Romania, under the supervision of the "Seismology and Physics of the Earth's" section of the National Romanian Committee of Geodesy and Geophysics, organized in four main domains: Seismology, Structure of the Lithosphere, Engineering Seismology and Heat Flow Studies.

Romania is characterized by moderate-to-high seismic activity, experiencing 3-4 destroying earthquakes per century, located at the Carpathian Arc Bend, in the Vrancea region, in a particularly confined focal volume at intermediate depths. The strong earthquakes generated here are significantly affecting extended areas in Europe. From time to time, earthquakes in the 5-6 magnitude range are generated in the crustal domain, as well, mostly in the regions of contact between platform and orogen zones.

Since Seismology is a data-driven science, special efforts were made in the last decade to develop and improve the data management, including acquisition, processing and rapid exchange of seismic information. The National Institute for Earth Physics is operating now a network of 102 seismic stations connected in real time to the National Data Centre in Bucharest. Part of the stations belongs to GEOFON network (one station), VEBSN network (6 stations) and AFTAC (one array) and is continuously exchanging data with other seismological centres. This network is designed first to monitor natural and induced seismicity, and to rapid disseminate high-level information in case of large earthquakes. At the same time, a strong motion network of 46 high quality digital accelerometers has been installed in the framework of the Romanian-German co-operation.

In the field of **Seismological Research**, important achievements were obtained during 2011-2014 period in the following domains:

- historical seismology and macroseismology;
- monitoring of natural and induced seismicity and early warning;
- seismic source physics;
- wave propagation;
- seismotectonics;
- geohazards;
- earthquake forecasting;

In the field of **Engineering seismology** significant efforts were made to predict the peak values and spectral characteristics of the strong motion in large urban areas, like Bucharest. At the same time, important efforts were made to determine the site effects and microzonation maps for most of the cities from Romania.

In the field of **Lithosphere Structure** the most significant results are referring to the deep structure of the lithosphere, determined from seismic data correlated with the available geological, geophysical and geodetic data.

In the frame of **Heat Flow Studies**, the geothermal structure and evolution of the lithosphere in various tectonic units, as well as problems of borehole climatology, such as inversion of borehole temperature data and air-soil heat transfer, were tackled.

Dr. Mircea RADULIAN

PART I: SEISMOLOGY

The National Institute for Earth Physics (NIEP, http://www.infp.ro) is the leading institution for seismology in Romania, responsible for the earthquake monitoring of the territory and basic and applied researches in seismology. It was established in 1977 as an organization for research and development in Earth sciences. Now it is coordinated by the Romanian Ministry for Education and Scientific Research, being mainly financed by contracts from public sources. It has a wide background in earth sciences research, with focus on seismic source and seismotectonics, hazard assessment and earthquake forecasting.

The seismological research in Romania during the 2011-2014 time interval has been focused on seven main directions:

1) **historical seismology and macroseismology**
2) **monitoring of natural and induced seismicity**
3) **seismic source physics**
4) **wave propagation**
5) **seismotectonics**
6) **hazard assessment**
7) **earthquake forecasting**

Since Romania is an earthquake prone area, it is of crucial importance to obtain quantitative information needed for seismic risk mitigation and related public policies and seismic safety measures. The most damaging earthquakes in Romania concentrate in Vrancea region, located at the sharp bend of the Eastern Carpathians chain, in a well-confined focal volume at intermediate depths (60 to 200 km). The extremely peculiar seismotectonics and geodynamic processes in this area focused the attention of numerous seismologists. At the same time, taking into consideration the dramatic social and economical implications of the Vrancea earthquakes, major efforts have been made to seismic hazard assessment and seismic microzonation of the large urban areas affected by these earthquakes, and first of all of Bucharest, for long-term protection against earthquakes.

Historical seismology and macroseismology

Contemporary seismology must respond to necessity for security of modern and critical infrastructures (N.P.P., dams etc.). To come to this goal extensive research on historical earthquakes and their physical characteristics is of primary importance. Recently, significant steps forward have been achieved within the historical seismology field by collecting large amount of historical records for the earthquakes in Romania. The main attention was focused on the strongest earthquakes which control the maximum observed intensities and therefore largely determine the seismic hazard level and implicitly the anti-seismic design and strategy. Also great attention was paid to those earthquakes and which are important in defining specific seismogenic areas, but for which we have poor information.

New records were found in some archives which have not been investigated until now. Some of the discovered information indicated the occurrence of seismic events unknown so far. All the historical information have been evaluated and re-evaluated

(Constantin et al., 2011; Rogozea et al., 2013, 2014). Different magnitude and depth estimations were calibrated against observation data. These results were obtained in the framework of the project "Fundamental Research of Historical Seismology and Paleoseismology needed for the assessment of long-term seismicity and seismic hazard" (2007-2016 National Strategic Plan for Research, Development and Innovation II) with the participation of two partners (ICM and GIR). Through this research we have succeeded the achievement of a database as complete as possible with the purpose of a more real seismic hazard assessment, which may lead to a significant reducing of the seismic risk.

In order to set the basis of some rigorous standards and norms of anti-seismic design, capable of assuring maximum security to buildings, in accordance with the idea of promoting and developing a national system, compatible with the European standardizing systems, a few large research activities were developed especially for re-evaluating and harmonizing of the macroseismic maps of the significant earthquakes occurred on the Romanian territory (see Pantea and Constantin, 2011, 2013 – Figure 1).

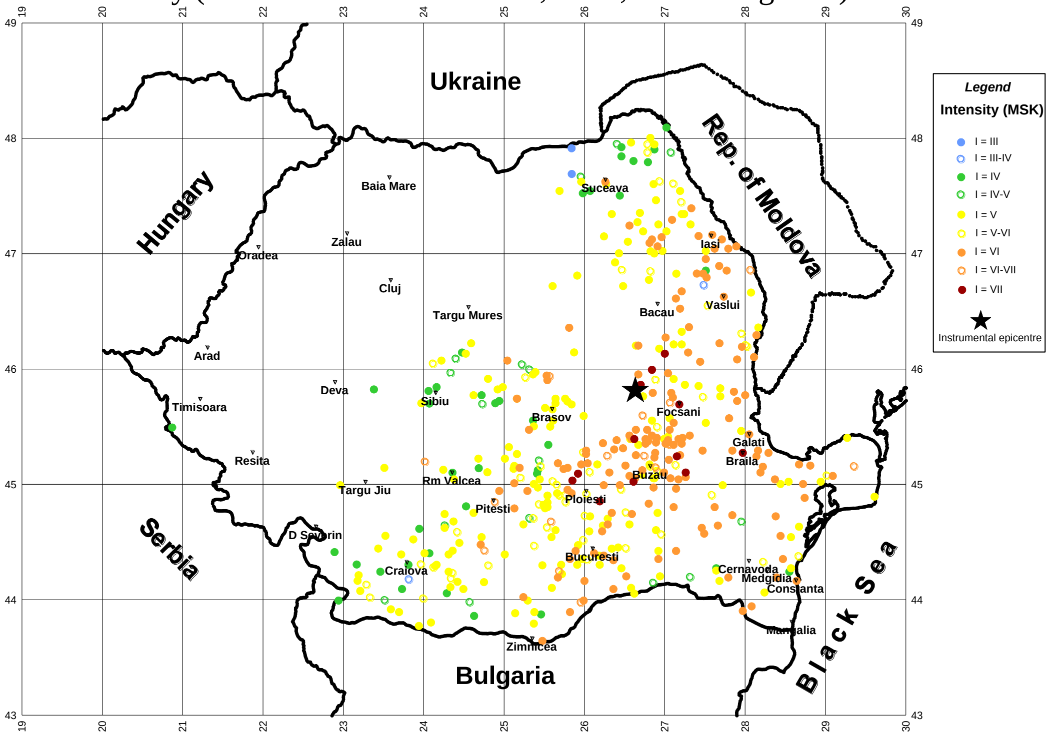


Fig. 1- Intensity map of the October 27, 2004 Vrancea subcrustal earthquake (after Constantin and Pantea, 2013).

Taking this into consideration, we have obtained important results, in the field of macroseismology, in the framework of the project "Seismic macrozoning of the territory of Romania, based on revalued macroseismic intensities corroborated with complex geological and geophysical data" (2007-2016 National Strategic Plan for Research, Development and Innovation II) with the participation of two partners (GIR and UB-FGG). As concerns these type of information, macroseismic investigations have been carried out in order to define macroseismic field of the recent crustal and subcrustal earthquakes occurred on the Romanian territory (Constantin and Pantea, 2013). We note in this regard the new perspective open by integrative work carried out on the basis of the results obtained within successive Central European Initiative projects coordinated by NIEP in cooperation with Dipartimento di Matematica e Geoscienze – University of Trieste, the Abdus Salam International Centre for Theoretical Physics of Trieste, International Institute of Earthquake Prediction Theory and Mathematical Geophysics of Moscow, and institutes in the border countries (Bulgaria, Hungary, Republic of Moldova, Serbia, Ukraine) (see Kronrod et al., 2013) and within the large European project "Seismic Hazard Harmonization in Europe" (SHARE, www.share-eu.org).

Monitoring of natural and induced seismicity

The National Institute for Earth Physics (NIEP) operates a real-time seismic network designed to monitor the seismic activity on the Romanian territory, dominated by the Vrancea intermediate-depth (60-200 km) earthquakes.

The reduction of earthquakes impact on society is conditioned by the existence of a large number of high-quality observational data. The development in the last few years of the seismic network and of an advanced acquisition system are essential factors to achieve this goal.

Starting with 2002 the modernization of Romanian seismic network was based on the installation of new seismic stations acquired in real time. This network consists of digital seismic stations equipped with acceleration sensors (EpiSensor) and velocity sensors (broadband – STS2, CMG3ESP, KS2000, CMG40-T or short period – MP, SH-1, S13, Mark Product, etc).

The real-time digital seismic network consists of 102 seismic stations with three components and 2 arrays: BURAR with 12 elements and PLOR with 7 elements. All data recorded by this network are transmitted in real time at NIEP for automatic data processing, analysis and dissemination. The seismic stations locations and equipment characteristics for the real-time Romanian Seismic Network are shown in Table 1.

Table 1. Real-time stations existing in Romania

Station	**LAT**	**LON**	**ALT**	**Station Name**	**Digitizer Type**
ARR	45.3657	24.6332	924	Vidraru	Q330 Digitizer
BZS	45.6188	21.6401	260	Buzias	Q330 Digitizer
CJR	46.7133	23.5981	750	Cluj	Q330 Digitizer
GHRR	46.0605	27.408	209	Gohor	Q330 Digitizer
ISR	45.1187	26.5432	791	Istrita	Q330 Digitizer
CFR	45.178	28.1362	57	Carcaliu	Q330 Digitizer
AMRR	44.6102	27.3351	86	Amara	Q330 Digitizer
BISRR	45.5481	26.7099	866	Bisoca	Basalt Digitizer
BMR	47.6728	23.4969	227	Baia Mare	Q330 Digitizer
BUR01	47.6148	25.2168	1150.6	Bucovina Array	AIM24S Digitizer + Q330 Digitizer
BUR05	47.6326	25.2176	1184.8	Bucovina Array	AIM24S Digitizer + Q330 Digitizer
BUR32	47.633	25.1805	1397	Bucovina Array	Q330 Digitizer
CVD1	44.3207	28.0624	50	Cernavoda_1	Q330 Digitizer
DEV	45.887	22.898	249	Deva	Q330 Digitizer
ICOR	44.1168	27.8009	121	Ion Corvin	Q330 Digitizer
KIS	46.9975	28.8175	255	Chisinau	Q330 Digitizer
LEOM	46.4733	28.2467	54	Leova	K2 Digitizer
MDVR	44.7815	21.7128	720	Moldovita	Q330 Digitizer

MFTR	44.1779	28.4224	980	Murfatlar	Q330 Digitizer
OZUR	46.0956	25.7862	676	Ozunca	Q330 Digitizer
PLOR1	45.852	26.6466	706	Plostina Array	Q330 Digitizer
PLOR2	45.8502	26.6437	701	Plostina Array	Q330 Digitizer
PLOR3	45.854	26.6455	722	Plostina Array	Q330 Digitizer
PLOR5	45.8455	26.6635	650	Plostina Array	Q330 Digitizer
PLOR6	45.842	26.6416	720	Plostina Array	Q330 Digitizer
PLOR7	45.8603	26.6405	831	Plostina Array	Q330 Digitizer
PURM	46.5293	29.8723	40	Purcari	Q330 Digitizer
SCHL	45.5007	27.8302	520	Schela	Q330 Digitizer
SIRR	46.2653	21.663	544	Siria	Q330 Digitizer
SORM	48.135	28.3513	640	Sorm	Q330 Digitizer
TLBR	44.5445	28.0467	115	Topalu	Q330 Digitizer
VOIR	45.4371	25.0495	966	Voina	Q330 Digitizer
ADJ	46.0952	27.182	100	Adjud	K2 Digitizer
ASE	44.4445	26.0904	850	ASE-Bucuresti	K2 Digitizer
BAC	46.5669	26.9124	169	Bacau	K2 Digitizer
BBER	44.3085	26.1899	112	Berceni	K2 Digitizer
BDTR	44.4142	26.0224	67	Bucuresti Gradinita Dr. Taberei	K2 Digitizer
BFER	44.4049	26.0771	86	Ferentari	K2 Digitizer
BISC	44.4328	26.2135	125	Bucuresti Catelu	K2 Digitizer
BPLR	44.43	26.05	132	Politehnica Bucuresti	K2 Digitizer
BPO	44.4483	26.1378	143	ISU-Bucuresti Pompieri	K2 Digitizer
BTMR	44.437	26.1067	142	Geotec	K2 Digitizer
BUZR	45.1503	26.8099	141	Buzau	K2 Digitizer
BVCR	44.4301	26.1017	109	Bucuresti-Curtea Veche	K2 Digitizer
BVES	44.3862	26.1069	114	Bucuresti Gradinita Veseliei	K2 Digitizer
CLIR	44.3784	25.9414	84	Clinceni	K2 Digitizer
CLISU	44.1901	27.3557	590	ISU Calarasi	Basalt Digitizer
CNCR	44.4439	26.2619	105	Cernica	K2 Digitizer
COR	44.4656	26.0315	127	Giulesti	K2 Digitizer
CTISU	44.184	28.6491	740	ISU Constanta	Basalt Digitizer
CVDP	44.3421	28.033	62	Cernavoda Primarie	K2 Digitizer
DJISU	44.2971	23.8363	160	ISU Dolj	Basalt Digitizer
DTIR	44.4527	26.0717	84	Niculaie Titulescu	K2 Digitizer
FOC	45.7032	27.1906	86	Focsani	K2 Digitizer
GRISU	43.8898	25.9518	660	ISU Giurgiu	Basalt Digitizer
GSMB	44.4813	26.0273	89	Bucuresti-Gradinita	K2 Digitizer
INMR	44.5118	26.0773	104	INMH Bucuresti	K2 Digitizer
MHISU	44.6227	22.6535	102	ISU Mehedinti	Basalt Digitizer
OTISU	44.4278	24.3755	210	ISU Olt	Basalt Digitizer

PPC	44.9314	26.0201	154	Ploiesti-Protectia Civila	K2 Digitizer
PRAR	47.3616	26.2276	451	Petru Rares	Q330 Digitizer
SGEB	44.3812	26.1369	80	Bucuresti-Scoala	K2 Digitizer
TRISU	43.9719	25.3296	870	ISU Teleorman	Basalt Digitizer
BAIL	44.0201	23.345	100	Bailesti	Basalt Digitizer
BANR	45.3828	21.137	159	Banloc	Q330 Digitizer
COPA	44.1343	25.2172	114	Copaceanca	Basalt Digitizer
DRGR	46.7917	22.7111	923	Valea Draganului	Q330 Digitizer
EFOR	44.075	28.6323	103	Eforie	Basalt Digitizer
HERR	44.881	22.416	246	Herculane	Q330 Digitizer
HUMR	44.5281	24.9804	247	Humele	Q330 Digitizer
IAS	47.1931	27.553	195	Iasi	Q330 Digitizer
LEHL	44.4739	26.8194	900	Lehliu	Basalt Digitizer
MANR	43.8168	28.5876	72	Mangalia	Basalt Digitizer
NEHR	45.4272	26.2952	584	Nehoiu	Basalt Digitizer
PETR	45.723	27.2311	85	Petresti	K2 Digitizer
PUNG	44.2782	22.9325	131	Punghina	Basalt Digitizer
RASA	44.2144	27.1493	500	Rasa	Basalt Digitizer
SRE	44.6609	23.2038	386	Strehaia	Basalt Digitizer
SULR	44.6777	26.2526	129	Surlari	Q330 Digitizer
VASR	46.6415	27.7911	275	Vaslui	Basalt Digitizer
VLAD	43.9986	24.4038	138	Vladila	Basalt Digitizer
BURAR/BUR31	47.644	25.2002	1216.9	Bucovina Array	AIM24S Digitizer
TLCR	45.1861	28.8151	74	Tulcea	Q330 Digitizer
BAPR	44.4059	26.119	103	Bucurest - Parcul Copiilor	K2 Digitizer
BIR	46.2334	27.6436	168	Birlad	Q330 Digitizer
BSTR	44.4458	26.0984	125	Bucuresti-COS	K2 Digitizer
BUC	44.4107	26.0938	95	Bucuresti Cutitul de Argint	Makalu Digitizer
BUC1	44.3479	26.0281	120	Bucuresti Magurele	K2 Digitizer
CEI	47.6933	22.4619	169	Carei	Q330 Digitizer
CRAR	44.325	23.7999	125	Craiova	Q330 Digitizer
CVDA	44.3336	28.0374	43	Cernavoda	Q330 Digitizer
GISR	45.4411	28.0541	67	Galati ISU	K2 Digitizer
GIUM	45.485	28.2081	102	Giurgiulesti	K2 Digitizer
INCR	44.441	26.1611	145	Bucuresti Incerc	Q330 Digitizer
JOSR	46.7059	25.5154	749	Joseni	Q330 Digitizer
MDB	46.1497	24.3765	423	Medias	K2 Digitizer
PLAR	44.9142	26.0274	212	Ploiesti Astra	Q330 Digitizer
RMGR	44.6627	22.6922	119	Halanga	Q330 Digitizer
RMVG	45.0363	24.2848	264	Ramnicu Valcea	K2 Digitizer
TNR	45.652	24.273	519	Turnu Rosu	Q330 Digitizer
TSCT	44.1608	28.6572	70	Contanta - Port	Q330 Digitizer
TSMN	43.8011	28.595	70	Mangalia - Port Far	Q330 Digitizer

				Verde	
TSSL	45.1621	29.7269	68	Sulina	Q330 Digitizer
TUDR	45.5939	27.6687	33	Tudor Vladimirescu	Q330 Digitizer
BIZ	46.9387	26.1029	549	Bicaz	Q330 Digitizer
TPGR	44.8565	28.4196	449	Topolog	Q330 Digitizer
ODBI	45.7633	27.0558	226	Odobesti	Q330 Digitizer
ZIMR	43.6572	25.3652	88	Zimnicea	Q330 Digitizer
GIRR	46.9551	26.5009	334	Girov	Q330 Digitizer
GRER	45.3801	26.9747	287	Greabanu	Q330 Digitizer
HARR	44.6893	27.9303	123	Harsova	Q330 Digitizer
JURR	44.7661	28.8769	37	Jurilovca	Makalu Digitizer
MTUR	45.2349	25.0739	1083	Matau	Q330 Digitizer
PGOR	44.9199	26.9768	102	Pogoanele	Q330 Digitizer
PRAR	47.3616	26.2276	451	Petru Rares	Q330 Digitizer
SECR	45.0355	26.0677	420	Seciu	K2 Digitizer
SGRR	44.2228	25.9743	115	Singureni	Makalu Digitizer
SIBR	45.8099	24.1757	463	Sibiu	Makalu Digitizer
STFAR	44.8629	24.9609	495	Stefanesti	Q330 Digitizer
TIM	45.7365	21.2211	134	Timisoara	K2 Digitizer
VARL	45.8996	27.8487	123	Varlezi	K2 Digitizer
ARCR	47.0855	24.3537	356	Arcalia - Bistrita Nasaud	Q330 Digitizer
DOPR	45.9675	25.3886	544	Dopca	Q330 Digitizer
GZR	45.3933	22.7767	850	Gura Zlata	Q330 Digitizer
LOT	45.446	23.7698	1361	Lotru	Q330 Digitizer
MILM	46.9186	28.8127	640	Milesti	Q330 Digitizer
MLR	45.4909	25.945	1392	Muntele Rosu - Romania	Q330 Digitizer
PLOR/PLOR4	45.8512	26.6498	680	Plostina Array	Q330 Digitizer
TESR	46.5118	26.6489	375	Tescani	Q330 Digitizer
TIRR	44.4581	28.4128	77	Targusor	PS6-24 Digitizer
VOIR	45.4371	25.0495	966	Voina	Q330 Digitizer
VRI	45.8657	26.7277	475	Vrancioaia	Q330 Digitizer
BUR02	47.6187	25.2209	1142.9	Bucovina Array	AIM24S Digitizer
BUR03	47.6085	25.2179	1205.3	Bucovina Array	AIM24S Digitizer
BUR04	47.6182	25.2122	1162.4	Bucovina Array	AIM24S Digitizer
BUR06	47.6169	25.2444	1213.1	Bucovina Array	AIM24S Digitizer
BUR07	47.6427	25.2324	1230.8	Bucovina Array	AIM24S Digitizer
BUR08	47.6441	25.2003	1215.4	Bucovina Array	AIM24S Digitizer
BUR09	47.6164	25.1901	1256.9	Bucovina Array	AIM24S Digitizer
IPH2	45.8502	26.6437	701	Infrasound Plostina	Q330 Digitizer
IPH3	45.854	26.6455	722	Infrasound Plostina	Q330 Digitizer
IPH4	45.8512	26.6498	672	Infrasound Plostina	Q330 Digitizer
IPH5	45.8455	26.6635	650	Infrasound Plostina	Q330 Digitizer
IPH6	45.842	26.6416	720	Infrasound Plostina	Q330 Digitizer

IPH7	45.8603	26.6405	831	Infrasound Plostina	Q330 Digitizer

The remote seismological stations have three-component seismometers for weak motions and three-component accelerometers for strong motion.

In cooperation with the Institute of Geophysics and Seismology Kishinev, Republic of Moldova, we installed three seismic stations in Republic of Moldova. The seismic stations were installed at Leova (LEOM), Giurgiulesti (GIUM) and Milestii Mici (MILM). Also in collaboration with the same institute two more seismic stations were installed in Kishinev (KIS) and Soroca (SORM). All the data from the seismic stations installed on the Republic of Moldova territory are received in real time at NIEP Data Centre using seedlink connection.

The primary goal of the real-time seismic network is to provide earthquakes parameters from more broadband stations with high dynamic range in order to compute more rapidly and with better accuracy the location and magnitude of the earthquakes. Seedlink and Antelope[TM] program packages are used for real-time (RT) acquisition and data exchange.

The real-time digital seismic network developed by NIEP is represented in Figure 1. Near-future strategy includes installing additional broad band stations in the central and western part of Romania and other 40 strong motion stations in Bucharest city.

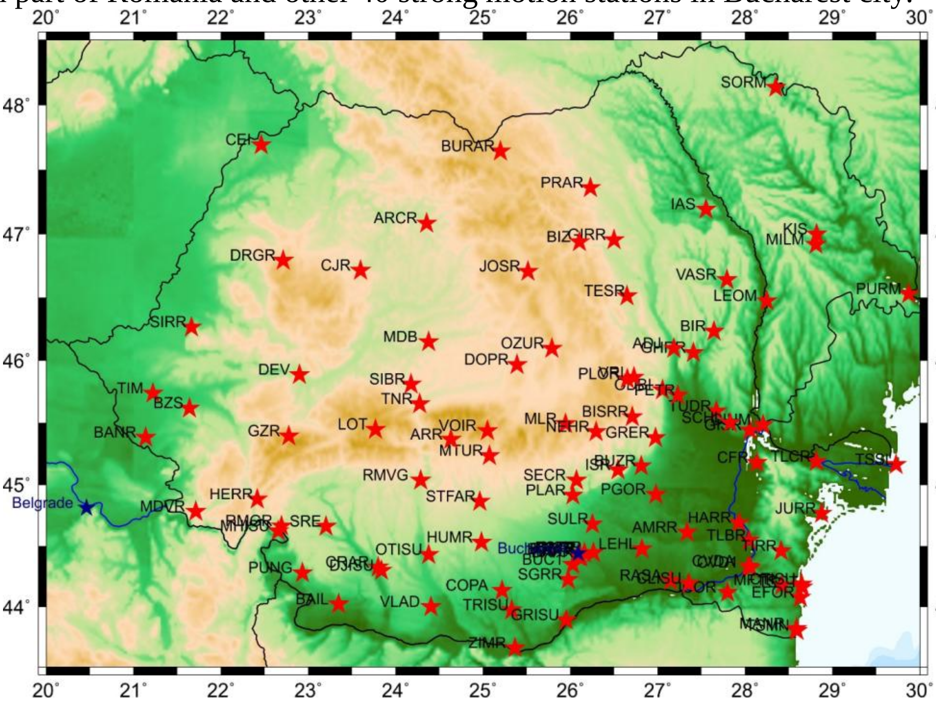


Fig. 1- Real Time Seismic Network of Romania

A completely automated seismological system Antelope (developed by BRTT) (Figure 2) runs at the Data Center in Magurele. The Antelope[TM] data acquisition and processing software run on two workstations for real-time and post processing. The Antelope real-time system provides automatic event detection, arrival picking, event location and magnitude calculation. It provides graphical display and automatic location within near real-time after a local, regional or teleseismic event occurred (Neagoe and Ionescu, 2009).

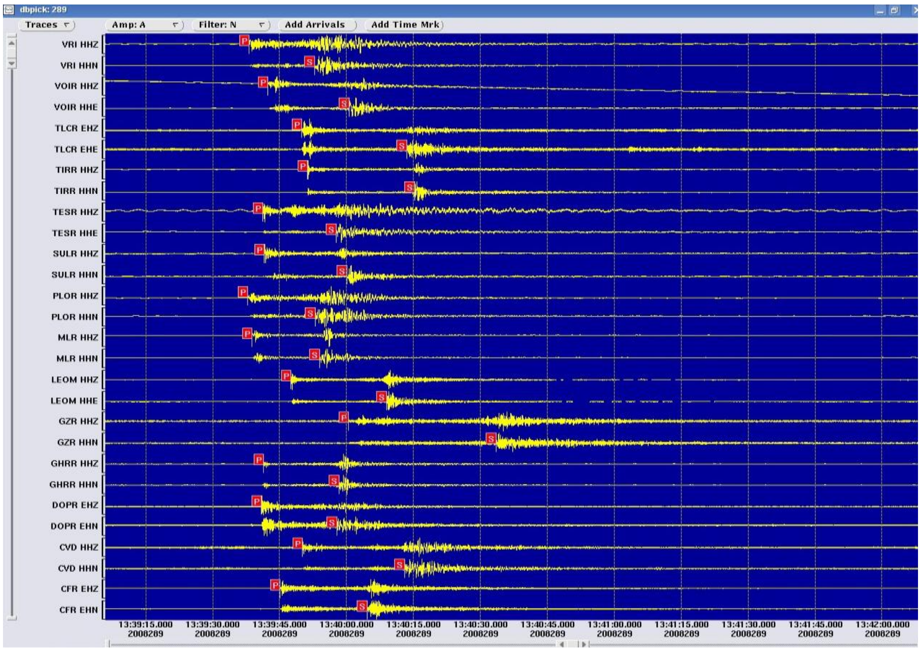


Fig. 2 - Example of manual data processing with Antelope software

SeisComP 3, another automated system, run at NIEP providing the following features: data acquisition, data quality control, real-time data exchange, network status monitoring, real-time data processing, issuing event alerts, waveform archiving, waveform data distribution, automatic event detection and location, easy access to relevant information about stations, waveform and recent earthquakes (Figures 3 and 4).

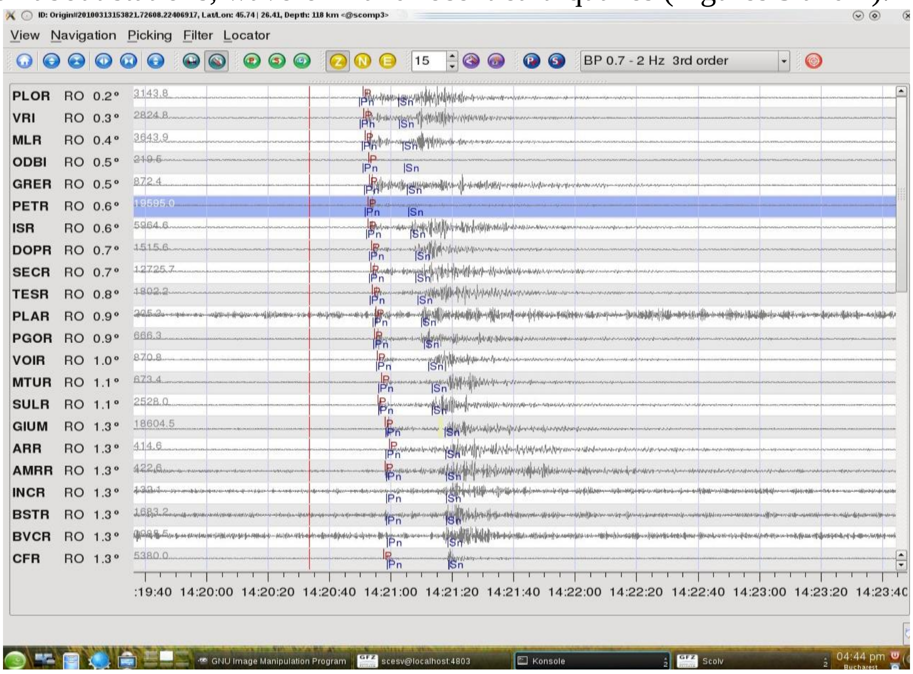


Fig. 3 – Automatic detection using SeiscomP 3 Software

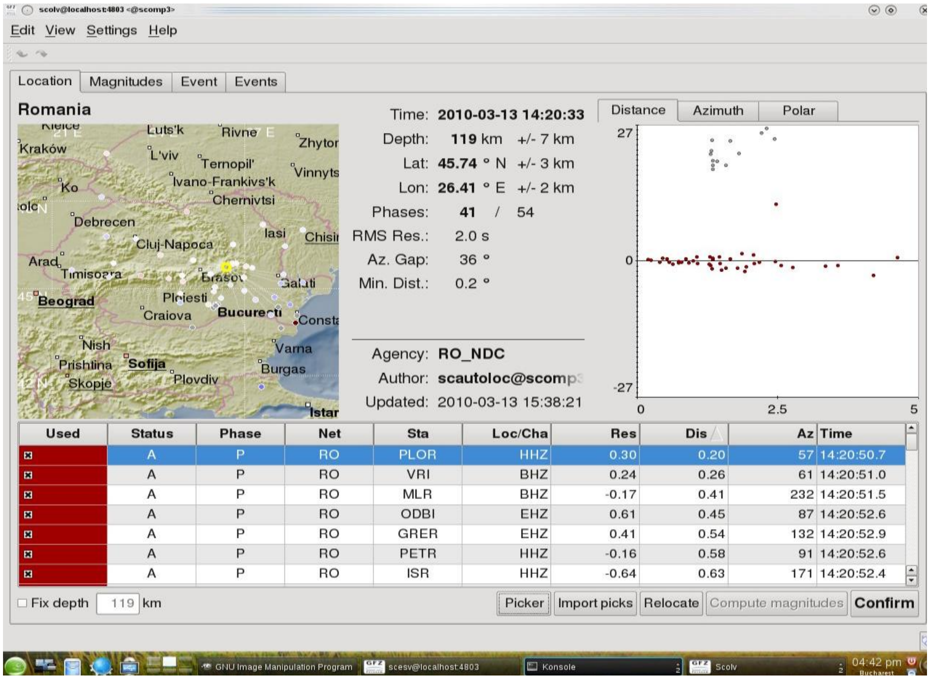


Fig. 4 Seismic data processing using SeiscomP 3 Software

The Romanian Seismic Network exchanges data with international organizations like ORFEUS and IRIS and with data centers from other European countries via Internet. The provided data consist in near real-time waveform data from 6 broadband stations: Iasi (IAS), Dragan (DRGR), Craiova (CRAR), Bucharest (BUC1), Vrincioaia (VRI), Muntele Rosu (MLR) and Bucovina (BURAR) array (Figure 5).

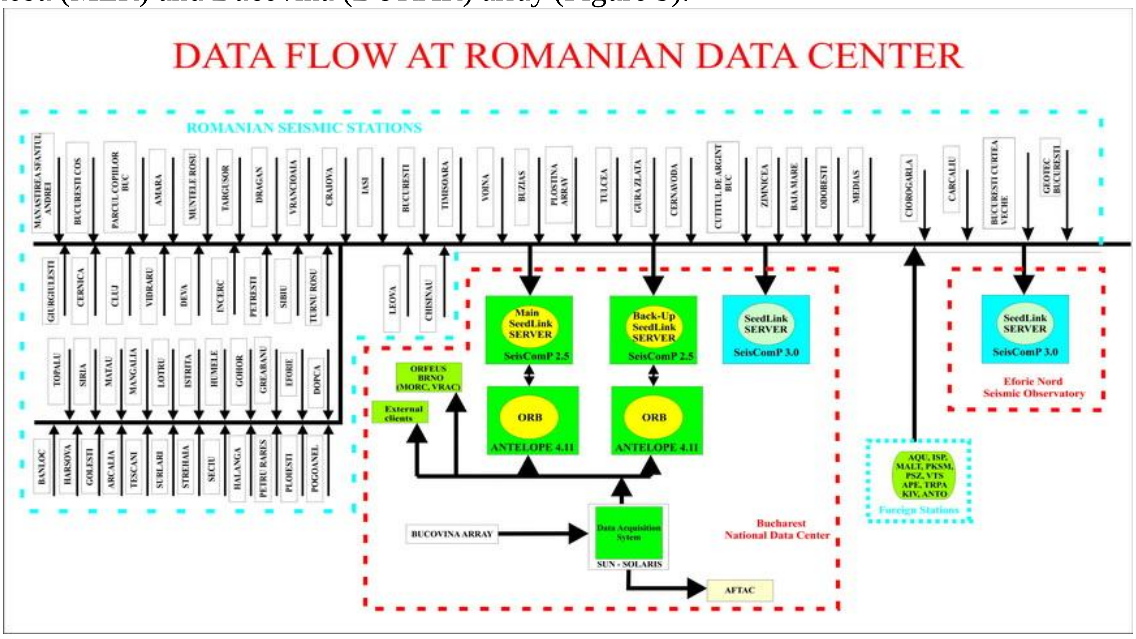


Fig. 5 – Data Flow at Romania Data Center

For automated data acquisition from seismic stations at NDC two servers are used, one main server which use Antelope 4.11 software and the second one with Seiscomp 3 program, considered as back-up. For data acquisition at seismic stations we use for 34 stations Antelope 8.0.2 program who runs on a pc light called Marmot and for other 48 stations a seedlink server is used from the SeisComP 2.1 package. For data acquisition from the seismic stations we use seedlink protocol from Seiscomp 2.5 package with chain pluggin or orb pluggin.

Both systems produced information about local and global parameters of earthquakes. In addition, Antelope is used for manual processing (association events, magnitude computation, database, sending seismic bulletins, calculation of PGA and PGV, etc.), generating ShakeMap products and interacts with international data centers.

In order to make all this information easily available across the Web and also lay the grounds for a more modular and flexible development environment the National Data Center developed tools to enable centralizing of seismological data from software such Antelope. Because Antelope is using a dedicated database system (Datascope, a database system based on text files) we moved the data to a more general-purpose database, Mysql, which acts like a hub between different acquisition systems used in the data center. Mysql database also provides better connectivity at no expense in security (Figure 6).

Mirroring certain data to MySQL also allows the National Data Center to easily share information to the public via the new application which is being developed and also mix in data collected from the public (e.g. information about the damages observed after an earthquake which internally is being used to produce macroseismic intensity indices which are then stored in the database and also made available via the web application). For internal usage there is also a web application which uses data stored in the database and displays earthquake information like location, magnitude and depth in semi-real-time.

Another usage of the data collected is to create and maintain contact lists to which the data center sends notifications (SMS and emails) based on the earthquake parameters.

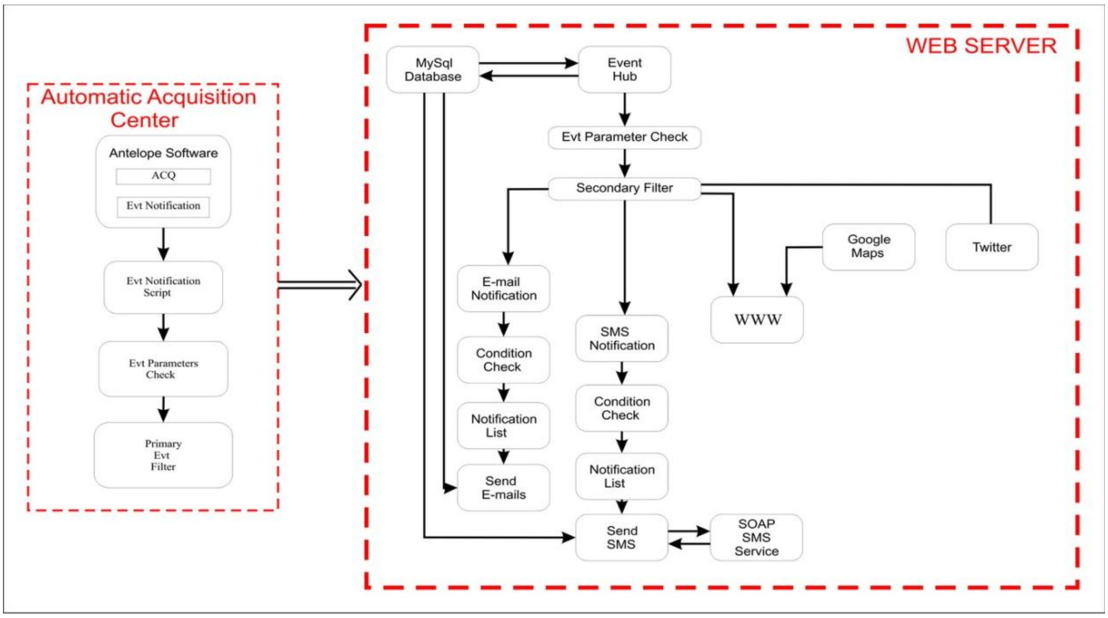


Fig. 6 - Web Server Configuration

NIEP has more than 25 years of experience in global seismological monitoring in support of the Comprehensive Nuclear-Test-Ban Treaty (CTBT). It is participating to the international verification activities with the seismic station Muntele Rosu, which was included in the auxiliary seismic network of the International Monitoring System, and with the operation of the Romania's National Data Centre (NDC). In order to ensure Romania's technical contribution to CTBT at the operational standards required by the Treaty, since 1999 an important upgrade has been under development both at the seismic station Muntele Roşu and at the NDC, involving both technical cooperation with the Government of Japan and technical assistance from the CTBT Organization. Hence, in the fall of 2001 a new seismic monitoring system was installed and is now fully operational, by recording continuous earth motion data at Muntele Rosu site and transmitting these data in real-time to the facilities in Bucharest, in the framework of the Japan International Cooperation Agency project „Technical Cooperation for Seismic Monitoring System in Romania".

Plostina seismo-acoustic array is located in the central part of Romania, in Vrancea region, (Figure 7). The array deployment started in 2007, when four seismic elements (PLOR1, PLOR2, PLOR3 and PLOR4) were installed. In 2009, two more seismic sites (PLOR 5 and PLOR6) were added, and the infrasound array deployment was initiated, by placing of three infrasonic instruments (IPH4, IPH5 and IPH6), collocated with the corresponding seismic locations. In 2010, another seismo-acoustic element (PLOR 7 and IPH7) was added and during 2012, sites 2 and 3 where equipped with infrasound sensors. Plostina seismo-acoustic array is currently distributed over an area of 3.5 km^2.

Fig.7. Plostina Observatory and elements of integrated system operating in the area (PLOR* - seismic array, IPH* - infrasonic array)

Presently, at Plostina, NIEP operates an integrated system (Figure 8) which includes advanced technologies such as: seismic and infrasound arrays, strong motion sensors, magnetic field and electric field monitoring, soil temperature measuring, and a weather station. The main applications of this system are:

- monitoring of the local microseismic activity
- acoustic measurement (infrasound monitoring of explosions, mine and quarry blasts, volcanic eruptions, earthquakes, aircraft etc.)
- observation of the magnetic field variation in correlation with solar activity
- observation of the variation of radioactive alpha gases concentration
- observation of the variation of telluric currents.

Since July, 2002, a new seismic monitoring system, **Bucovina Seismic Array (BURAR)**, has been established in the Northern part of the country (Figure 7), in a joint effort of the Air Force Technical Applications Center (AFTAC), USA and NIEP. Data recorded by BURAR array are continuously transmitted in real time to the National Data Center of USA in Florida and to NDC, in Magurele. BURAR seismic array consists of 10 seismic stations located in boreholes and distributed over an area of 5 km^2. Nine stations are equipped with short-period vertical sensors (GS-21) and one station is equipped with broad-band three-component sensor (KS 54000).

In 2008 five new elements equipped with 3-C broad-band sensors were installed aiming to obtain the most convenient array combination of 3-C elements for the recording and identification of the secondary seismic phases, to optimize the array response, achieving a superior sensitivity and resolution of BURAR in S-type seismic signals identification.

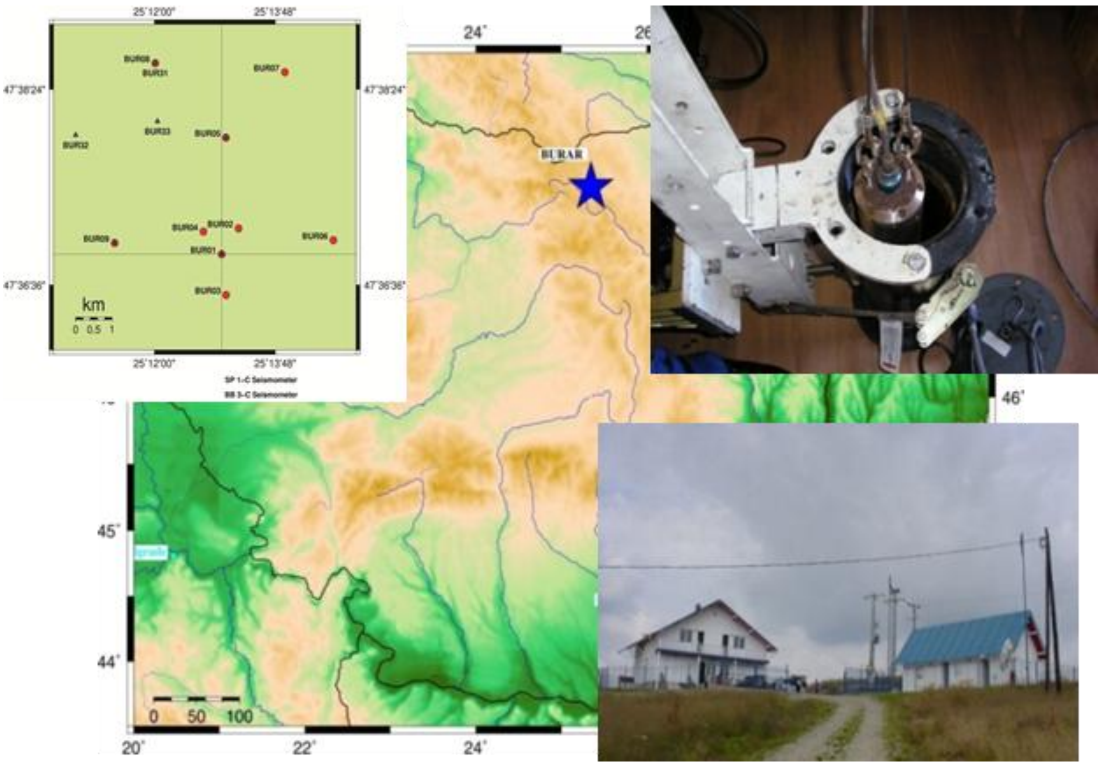


Fig. 8. Bucovina Observatory (BURAR) and array elements distribution

Among the most significant achievements in the past years we mention:

- A fully automated and networked system dedicated to digital acquisition and real-time processing of seismological data, as well as to rapid exchange of earthquake information has been implemented. At present, NIEP participates with 6 BB stations to the Virtual European Broadband Network and is ready to significantly increase its contribution to the objectives of the research infrastructures integrating activity, one of the main domain of the Structuring the European Research Area.
- The Romanian Earthquake catalogue (ROMPLUS) comprises updated, complete, user-friendly and rapidly accessible earthquake information. The catalog refers to earthquakes occurred on Romanian territory and in the neighbour boundaries since 984 up to present, including information related to locations and other source parameters, as well as links to

waveforms of strong earthquakes. Seismicity analysis is continuously performed implying updating of the earthquake catalogue, spatial-temporal-magnitude patterns in different seismic regions of Romania, earthquake sequences. Interpretation and reconsidering of historical data constitutes an important issue for the seismic hazard investigation.

- Field investigations of microearthquakes and earthquake sequences;
- Research on natural and induced seismicity.

Future Developments of the Romanian Monitoring Network

The Romanian Seismic Network will be enlarged by the installation of new stations that will provide seismic data in real-time to the data center. The upgraded network will provide new data for site effects studies and microzonation purposes and will be used for developing and evaluations of the Shakemaps for all country and in the Bucharest area.

For future development, amongst others, the data center plans to compare the locations provided by Antelope 4.11 and Seiscomp3 using the same velocity global model.

Seismic source physics

Modelling the earthquake source is one of the main tasks with the long-term goal to construct a quantitative physical model for the entire earthquake process, including tectonic stress accumulation, nucleation of rupture, and the dynamics of the rupture propagation and cessation. Integration of the multiple aspects of the earthquake phenomena, from the small scale (dynamic rupture) to large-scale (plate boundary tectonics) processes is becoming of increasing interest for many researchers.

The increase of the seismic network of the NIEP after 2011 in number and quality of instruments, the integration in the European virtual network have contributed to a better covering of the Romania territory and provided higher-quality database for seismic source studies. Besides the Vrancea intermediate-depth focus, where the most damaging earthquakes of Romania are generated, systematic investigations have been carried out in other seismogenic zones on the territory. A special focus has been drawn to cross-border integration data in the framework of a few European projects (SHARE project no. 226967; DACEA project no. 2 (1I) – mis etc code 636; ESNET project - mis etc code 641).

Waveform inversion for small to large earthquakes have been applied using local and teleseismic recordings in order to retrieve source parameters and focal mechanism. The recent advance in both observations and computer simulations has strongly increased our performance in constraining the source parameters over a broad magnitude range. Instrumental recordings from historical events have been digitized and corrected to be used in re-assessing the source parameters of historical significant earthquakes. This kind of recovery of information from the past can be crucial for seismic hazard evaluation and seismic cycle analysis.

Another approach to understand the way the seismic cycle in the Vrancea region evolves has been the stress transfer modelling. Apparently, the major Vrancea earthquakes are generated alternatively in two separated segments on depth and this behaviour would be in favour of a stress coupling among these segments. Stress transfer plays a major role also in generating aftershock sequences.

Seismic source scaling properties, seismicity clustering and geometrical alignments have been investigated in correlation with the tectonics, geodynamics and other geophysical properties. Possible coupling between the Vrancea subcrustal seismic activity and shallow seismicity in the overlying crust has been explored in a few studies. A lot of discussion has been addressed to issues related to the geotectonical models in order to explain the particular seismic activity at the South-Eastern Carpathians arc bend: oceanic slab detachment, continental delamination, deep instable gravitational root, etc., and their consequences on crustal movements, orogen features, magmatism, subsidence, heat flow and gravity.

As concerns the seismicity in the crust, many investigations have been carried out in order to define potentially active faults and their geometric and dynamic parameters. These parameters constitute basic input data for seismic hazard evaluation. Numerical techniques have been proposed to simulate earthquake process in the Vrancea seismic source and to generate synthetic earthquake catalogues.

One of the main targets of the NIEP is to model the influence of the seismic source on seismic hazard distribution and to simulate the strong ground motion characteristics in dense-populated areas of Romania, and first of all in Bucharest. The relative deconvolution methods, like spectral ratios or empirical Green's function deconvolution were applied to retrieve the source parameters. Implications of the source directivity and focal depth effects upon the strong ground motion distribution have been analyzed as well.

Wave propagation

The seismic wave propagation is the main factor which controls the shape and amplitude of the ground motion as recorded at the Earth's surface. Modelling the propagation of seismic waves through complex three-dimensional structures is one of the most difficult challenges in seismology.

The lateral inhomogeneities in the lithosphere and the local geology beneath the site are critical in shaping the ground motion distribution and subsequently in mapping the seismic hazard.

The analysis of travel times for different body wave phases provides the basic information related to the seismic wave path trajectory and velocity of propagation from the earthquake focus to the observation point. Relative techniques are applied as well, using double-differences and waveform cross-correlation for large sets of earthquake recorded data. S to P converted waves, as recorded by the Romanian seismic network, were investigated to determine the crustal thickness in the SE Carpathians arc bend area.

Seismic tomography using local body wave travel times was carried out to determine three-dimensional velocity structure beneath Romania territory. Of special interest was the tomography imaging for of the Vrancea subducting zone and its neighbourhood. P- and S-wave tomography illuminates a well-defined high-velocity body dipping almost vertically, where intermediate-depth earthquakes are generated. However, the extension of investigation to the west and north shows possible deep lithospheric roots in the South-Eastern Carpathians back-arc region as well. They were tentatively put into correspondence with magmatic activities which are still active there.

The seismic wave attenuation has been investigated using modal summation technique to model the complete synthetic waveforms. This technique has been developed within the Department for Earth Sciences of Trieste for one-dimensional and two-dimensional structural models. The spectral-ratio method has been applied as well to determine lateral variations in seismic wave attenuation.

The data recorded during long-range seismic experiments in Romania along different refraction profiles or by other temporary networks provide important additional information on specific wave propagation. They were designed mostly to investigate the

Vrancea region but extended also recently to the west, in the Carpatho-Pannonian region (South Carpathian Project, in cooperation with the University of Leeds).

The receiver functions technique is a tool frequently used to determine the crust and upper mantle structure at regional and global scale. P- and S-wave receiver functions are computed at the broadband stations of the Romania network to estimate vertical structure in the crust and upper mantle.

Anisotropy properties in the seismic wave propagation provides important new information and constraints in the seismotectonic modeling of the Vrancea region (subduction, flow pattern in the upper mantle, slab delamination etc.). Shear-wave splitting is a powerful diagnostic of anisotropy that has been used to detect mantle fabric and flow beneath Vrancea seismic region. This kind of investigation is fundamental for understanding thermal structure in the upper mantle, slab dehydration, melt generation and transport, and slab dynamics. Both SKS and SKKS broadband teleseismic shear waves were analyzed in order to investigate mantle and crust anisotropy properties over country territory. Shear wave splitting let to delay times up to 2 s and is highly variable with a marked change of the fast direction from perpendicular to the Carpathians Arc in the foredeep region to a parallel direction in the Vrancea epicentral area. It was assumed that the anisotropy is caused by specific flows induced by the particular geometry of the lithosphere body descending in the upper mantle.

Another approach to investigate the crustal seismic-velocity structure that has been applied in the last years is the use of surface wave dispersion and the ambient-noise cross-correlation. For pairs of stations the Green's function is computed by cross-correlating long and multiple time series currently recorded by the seismic network. The method takes advantage of avoiding the often highly nonuniform and sporadic distribution of earthquakes and of the increased density of stations after the recent seismic network improving.

Seismotectonics

Several new models of the seismotectonics in the Vrancea seismic region were proposed in the last years. Other studies were focused on the correlation between seismotectonics, earthquake focal mechanism, structure of the deep crust in the seismic active zones of the Carpathians foredeep, Dobrudja and Southern part of the Transylvanian depression.

Focal mechanism solutions were analysed in order to determine the stress field and to correlate with the seismicity.

Implications of paleomagnetic research on seismotectonics in the Carpathians region were studied.

Hazard assessment

1. *Seismic hazard*

The seismic hazard assessment is a crucial step towards mitigation of urban earthquake risk and improvement of disaster prevention management. A permanent threat for urban areas on the Romanian territory and extended areas in Europe comes from Vrancea intermediate depths destructive earthquakes. Bucharest is among the megacities mostly affected by those large earthquakes. Extensive studies concentrate on the characterisation of the macroseismic field of Romanian earthquakes, such as Vrancea intermediate-depth events and also crustal earthquakes, from Romania. The earthquakes from Romania and adjacent areas are documented for a millennium (since 984 a.c.) and represent very peculiar characteristics. The seismic hazard was evaluated using probabilistic and deterministic approaches for all seismogenic sources from Romania.

To apply the probabilistic approach, attenuation laws corresponding to Vrancea earthquakes were empirically determined in terms of macroseismic intensity and peak ground acceleration and a maximum magnitude value was prescribed. The seismic hazard assessment in dense-populated geographical regions and subsequently the design of the strategic objectives (dams, nuclear power plants, etc.) are based on the knowledge of the seismicity parameters of the seismogenic sources which can generate ground motion amplitudes above the minimum level considered risky at the specific site and the way the seismic waves propagate between the focus and the site. Extremely vulnerable objectives, like large cities, hydroenergetic dams (Moldovan et al., 2011) or nuclear power plants, are present all around Romania, and not only in the Vrancea intermediate earthquakes action zone. The best example is the western part of Romania that is not affected by Vrancea intermediate-depth earthquakes and where the crustal seismicity is high. In this part of the country are cities like Timisoara, Arad and Oradea and the "Portile de fier I and II" hydroenergetic dams.

The complete set of information required for a probabilistic assessment of the seismic hazard in Romania relative to the crustal (Moldovan et. al, 2012) and intermediate-depth sources (Ardeleanu et al., 2005) have been obtained: (1) geometrical definition of all seismic sources affecting Romania - Figure 2, (2) estimation of the maximum possible magnitude, (3) estimation of the frequency magnitude relationship, (4) estimation of the attenuation law and, finally, (5) computing PSH with the algorithm of McGuire – Figures 3 and 4.

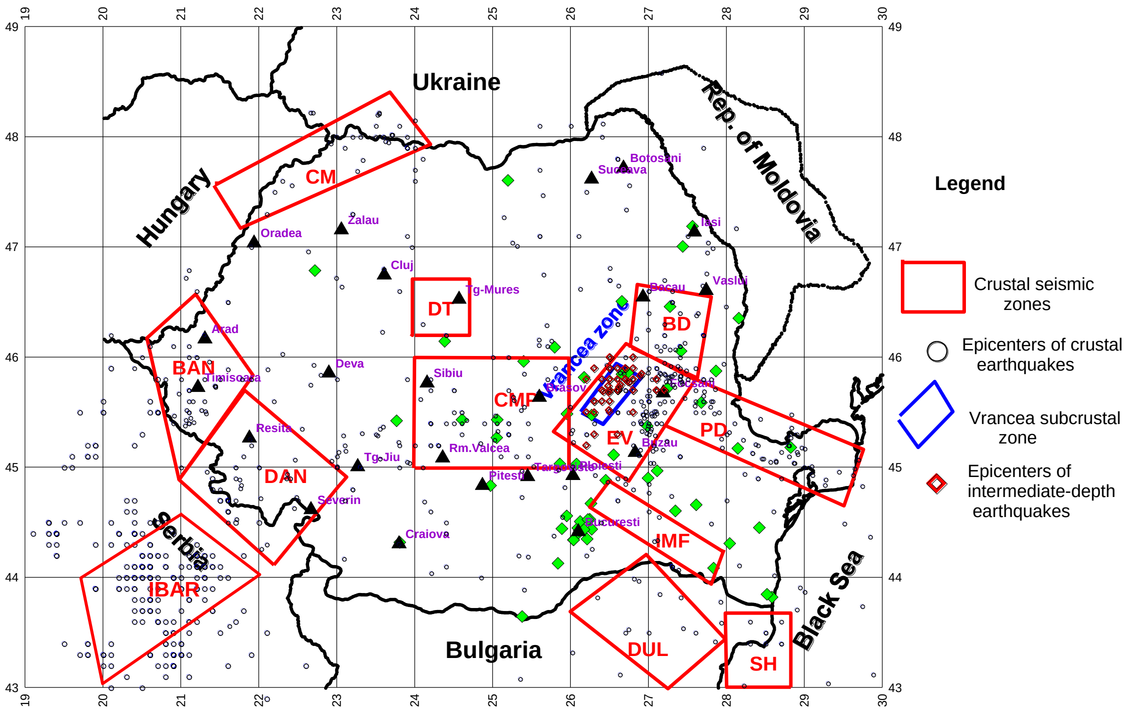


Fig. 2 - Seismic crustal and intermediate active zones in Romania and adjacent areas and their characteristics

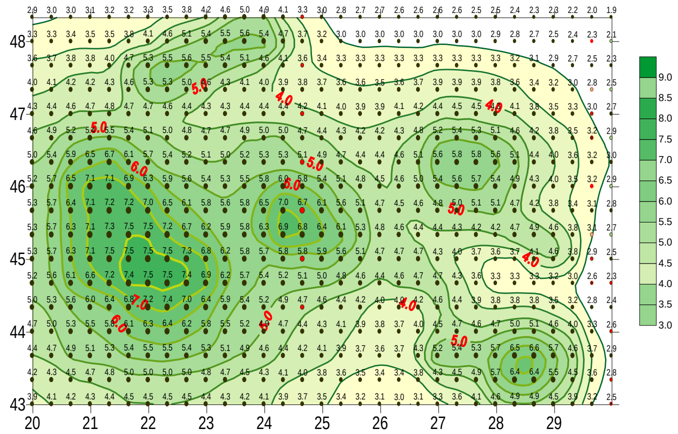


Fig. 3- Hazard map for Romanian crustal sources and return periods of 100 years (after Moldovan et al, 2008)

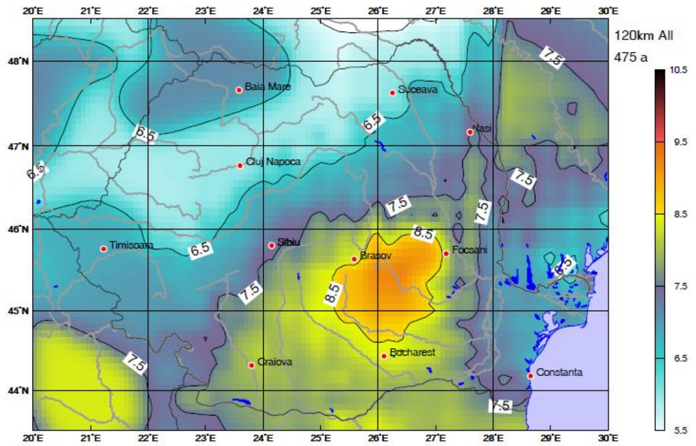


Fig. 4 - Seismic hazard from all source zones for a recurrence period of 475 years; colours represent intensities in MSK (after Ardeleanu et al, 2005)

Recent advances in computer technology make possible the use of the deterministic numerical synthesis of ground motion for seismic hazard calculations. The deterministic approach is completely different and complementary to the probabilistic approach. It addresses some issues largely overlooked in the probabilistic approach: (a) the effect of crustal properties on attenuation are not neglected; (b) the ground motion parameters are derived from synthetic time histories and not from overly simplified attenuation "functions"; (c) the resulting maps are in terms of design parameters directly, and do not require the adaptation of probabilistic maps to design ground motions; (d) such maps address the issue of the deterministic definition of ground motion in a way which permits the generalization to locations in which there is little seismic history.

2. Other geohazards

Besides earthquakes, other geohazards or geological hazards are events caused by geological features and processes that present severe threats to humans, property and the natural and built environment (landslides, volcanoes, avalanches, and tsunamis are typical examples of such events). Characterization of geohazards and their impact in Romania and in Balkan countries was the main topic of the project “Balkan Geohazard Assessment and Map” (grant OPP-024 from US Civilian Research and Development Foundation, 2007-2008) which subsequently were published in Muco et al. (2012).

Recently, NIEP is participating within the FP7 project "Assessment, STrategy And Risk Reduction for Tsunamis in Europe - ASTARTE" (FP7 ENV.2013.6.4-3, Grant agreement no: 603839).

Earthquake forecasting

The failure in predicting the strong earthquakes of Northridge, California (1994), Kobe, Japan (1995) and Sahalin (1995) drew attention on the serious limitations of the standard earthquake prediction methods and at the same time provoked seismologists to look for new approaches of this extremely complex problem.

Vrancea seismogenic zone is a conspicuous active area in terms of its extraordinary seismotectonic features, outstanding persistent and highly recurrent seismicity displaying a remarkable regularity in occurrence of large events and manifestation of a plethora of geophysical precursors and severe socio-economic impact with a huge felt area.

Extensive analyses in order to detect premonitory changes in seismicity patterns as possible precursors of the Vrancea strong shocks were performed for past and future earthquakes. Analysis and discussions of a variety of precursory seismicity patterns belonging to all temporal developmental stages of the preparatory geophysical process leading to the major Vrancea earthquake of August 30, 1986 were performed and documented, clearly proving that the earthquake would not has been unexpected .

Different algorithms, like CN and the geostatistical method were applied to predict the strong Vrancea earthquakes. The CN algorithm (Keilis-Borok&Rotwain, 1990) has been initially created for the retrospective analysis of the seismicity patterns which precede the strong earthquakes within California-Nevada regions. The algorithm has been modified so that it can be applied, without any parameters adjustment, for all the seismic regions in the world. The method consists in analysis of a set of precursory phenomena reflected in the temporal evolution of the seismicity recorded in the earthquake catalogue. Although it was firstly conceived for crustal events, the CN algorithm can be also applied for prognosis of the intermediate earthquakes. The results are different depending on the seismic region which is under study. Thus, in case of Vrancea and Sicily regions where the paleosubduction is one of the possible interpretations, the results are positive (in case of Vrancea the strong earthquakes from 1977, 1986 and 1990 have been predicted), while for intermediate earthquakes within the regions where the subduction is still active, the algorithm can not be applied.

It has been recently experimented the electromagnetic and infrasonic methods to predict Vrancea intermediate-depth earthquakes and look for seismo-electromagnetic and infrasonic precursors. NIEP operates a real-time geomagnetic, electric, electromagnetic VLF/LF and infrasonic network (named The Romanian Electromagnetic Field and Infrasound Monitoring Network - MEMFIS) consisting of 6 stations, 4 of them centered in the Vrancea seismic zone and 2 of them outside the seismogenic zone (Fig. 1).

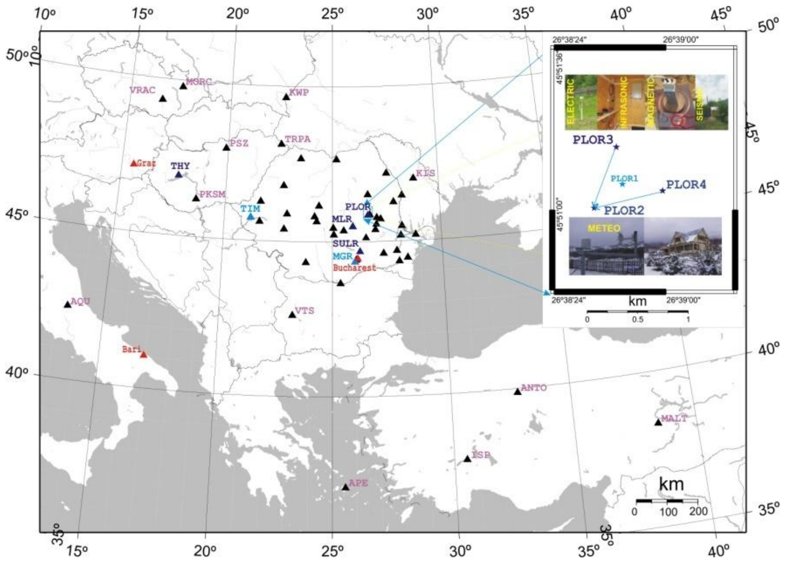


Figure 1. The Romanian seismic (black triangles) and geophysical network (blue and light blue triangles). On the figure are also marked the seismic stations that assures the real time seismic international data exchange and the THY Intermagnet station. In the upper right corner is presented the new Plostina geophysical network comprising seismic, magnetic, electric and infrasonic sensors

The geophysical data (geomagnetic, electric and infrasonic data) are transmitted in an ASCII format, from the stations to the data center, using the TCP/IP protocol. The time resolution is given by the chosen sampling rate, and the accuracy is of +/- 1µs; the measurement resolution is of 24 bits. The data transfer rate is minimum 0.5 Mbits/s. The Romanian data center collects geomagnetic data from all stations of the real-time INTERMAGNET network.

The Romanian Electromagnetic Field and Infrasound Monitoring Network (Table 1- http://www.infp.ro/cercetare/laboratoare/studii-magnetotelurice-si-bioseismice) is equipped with 4 triaxial fluxgate magnetometers (Bartington – Fig.2), with seismic sensors in each monitoring site, with 3 infrasound stations – MBAZEL2007 (Fig.2) and 1 Chaparral Infrasound sensor (Fig.3), 1 electrometer measuring the vertical atmospheric electric field - Boltek EFM100 (Fig.2) and one meteorological station –La Crosse WS-3600 (Fig.4).

Table 1. The geophysical observatories from the Romanian Electromagnetic Field and Infrasound Monitoring network

Observatory Code	Equipment	Latitude	Longitude	Altitude (m)
MLR	Seismic/magnetic	45.49N	25.95E	1360
SURL (SRL)	Seismic/magnetic	44.68N	26.25E	97
PLOR2	Seismic/magnetic +/- 100uT /infras+/-50PA	45.8502N	26.6438E	694
PLOR3	Seismic/magnetic +/- 100uT /infras+/-50PA	45.8539N	26.6455E	708
PLOR4	Seismic/vertical electric +/-20kV/m Boltek/infras MBAZEL2007+/-50PA / infras Chaparal/meteo	45.8512N	26.6499E	656
AZEL	VLF-LF/ meteo/ infras +/-50PA	44.3548N	26.0282E	76
Dobrudja Observatory	VLF-LF/meteo/vertical	44.0750N	26.6325E	23

	elctric Boltek			

The monitoring sites are located in Vrancea seismic zone (Fig.1) and one of them is located near Bucharest, outside the epicentral area. The geophysical database consists in more than 10 years of geomagnetic recordings at Muntele Rosu Observatory and in one year of multiple geophysical recordings (magnetic, electric and infrasonic) at Plostina Observatory - PLO2, PLO3 and PLO4.

Fig . 2. An outer image of PLO3 site and some of the equipments that are involved.in the monitoring process: Data Acquisition System, Microbarometer MBAZEL2007, Triaxial Fluxgate Magnetometer MAG-03MS. The Electric Field Monitor EFM-100 is installed at PLO4, in the vicinity of the Weather Station WS-3600.

Fig. 3. The Chaparal infrasound sensor located at Plostina main building (PLO4)

Fig. 4. A part of the meteorological station installed at PLO4

Starting with March 2009 the **Romanian Electromagnetic Field and Infrasound Monitoring Network** was enhanced with VLF and LF antennas (Fig. 5) and one Elettronika receiver (offered by Prof. P.F.Biagi- Department of Physics, University of Bari - http://beta.fisica.uniba.it/infrep/GroupsEU/ROM/Research.aspx) and is operating in the Dobruja Observatory (Table 1). The amplitude and phase data are collected with a 60 s sampling interval.

Fig. 5. Magnetic VLF and LF antennas installed on the roof of the Dobrudja Observatory

During the geophysical monitoring of Vrancea area there have been noticed a number of anomalies that have been identified to be in correspondence with local tectonic, atmospheric and space global phenomena.

Acknowledgements. *This report has been prepared by Dr. Mircea Radulian, Dr. Iren-Adelina Moldovan, Dr. Angela Constantin, Dr. Alexandru Marmureanu, Dr. Mihaela Popa and Dr. Daniela Ghica*

PART II: ENGINEERING SEISMOLOGY

The evaluation and mitigation of the seismic risk is one of the permanent and urgent problems facing the Romanian society, equally implying work of seismologists, geologists and engineers. Significant efforts were made to predict the peak values and spectral characteristics of the strong motion in large urban areas, like Bucharest. At the same time, important efforts were made to determine the site effects and microzonation maps for the same city.

Every damaging earthquake demonstrates the importance of the local site effects and their worsening of the damage and economic losses. Another open problem is the correct definition of the local site effect and the possibility to control it to a certain degree. The experience gained of some recent earthquakes (Kobe, Loma Prieta, Mexico, etc.) shows the importance of quantifying the physical parameters of the local site and other local conditions which can affect the severity of ground shaking that a site may experience and the potential for locally induced effects, such as landslides, liquefaction, floods, fires, etc.

A number of studies have significantly contributed to the establishing of the response spectra to be used in connection with the large intermediate-depth earthquakes generated by the Vrancea region of Romania and the existing European Building Code Eurocode 8 was critically reviewed and improvements were suggested to orient it to the Carpatho-Balkan region.

The modal summation method and finite differences technique were applied to calculate the expected ground motion in Bucharest due to large intermediate-depth Vrancea earthquakes. The results outlined that the presence of alluvial sediments and the possible variation of the event scenario require the use of all three components of motion for a reliable determination of the seismic input.

Study of dynamic parameters of soils by using resonant columns and geophysical methods, realistic modelling of seismic input taking into account source, wave path propagation and local site effects have been permanent tasks for Romanian seismologists and important outcomes for seismological engineers. Laboratory analyses were made also to determine the attenuation effects for surface layers and its dependence on the strain level induced by large earthquakes.

The role of the non-linear effects in the local site response has been the subject of several studies outlining their important contribution to the strong motion in Bucharest area. This will be a challenge for seismological research in the next years.

Engineering Seismology

Two main (interrelated) topics were dealt within this frame:

- characterization of ground motion severity at a definite location;
- summarizing the outcome of analysis of accelerographic records obtaned during recent strong Vrancea earthquakes.

The concern for the characterization of ground motion severity was due to the direct experience of the destructive earthquake of 1977.03.04. The survey of earthquake effects, combined with the data provided by the strong motion record of Bucharest – INCERC, raised the need to consider intensity not only globally, but also as related to various spectral bands. A system of intensity quantification based on accelerographic data was developed and applied to the analysis of numerous ground motion records. An application forwarded to the NATO Office, Brussels, was accepted and NATO provided the Collaborative Linkage Grant No. 981619 for the Project *QUANTIFICATION OF EARTHQUAKE ACTION ON STRUCTURES*. The cooperative activities in this framework, in which researchers from Bucharest, Moscow and Chişinău were involved, lasted from 2005 to 2008. They included meetings in Bucharest, Chişinău and Moscow and led to the drafting of some joint papers. Finally, the NATO Office agreed to provide support for the publication of a volume with the same title. The main participants in these activities were the authors of this volume. Several publications on this subject were drafted and some of them were presented at the European Conferences on Earthquake Engineering of 2006 and 2010 and at the World Conference on Earthquake Engineering of 2008. A summary publication on this subject was represented by the volume *Quantification of seismic action on structures (studies related to a project sponsored by NATO in the frame of the Program Science for Peace).* (Program Director & Editor: H. Sandi. Co-authors: F. Aptikaev, I. S. Borcia, O. Erteleva, V. Alcaz). AGIR Publishing House, Bucharest, 2010.

An invited lecture on related topics, by H. Sandi: "Seismic intensity and hazard quantifications, versus some earthquake engineering requirements” (slides) was prepared, for. *Proc. Advanced Conference on "Seismic Risk Mitigation and Sustainable Development”.* Trieste, 10 – 14 May 2010, Abdus Salam International Centre for Theoretical Physics.

The activities devoted to summarizing the outcome of analysis of accelerographic records obtaned during recent strong Vrancea earthquakes relied on the infomation provided by the numerous valuable strong motion records obtained during the strong Vrancea earthquakes of 1977.03.04, 1986.08.30, 1990.05.30 and 1990.05.31.

The most relevant findings related to the features of the radiation pattern put to evidence are:

- the variability of directivity from one event to the other;
- in some cases, the variability of directivity, for a same event, from one spectral band to the other.

The features of the radiation pattern were evaluated also in relation to the variability of the spectral contents of ground motion, put to evidence by the ensemble of response spectra presented. As a most striking example, the results obtained show that, for a large area, the longer period ordinates of response spectra were unexpectedly low in case of the event of 1990.05.30. They also show that the source mechanism was of a nature that led to diferent directivities of radiation for different spectral bands. The challenge for a joint study of source mechanisms and of response spectra becomes obvious.

The most relevant findings related to the spectral contents made obvious by instrumental data and response spectra are related to the cases of stability and of variability respectively, of spectral contents of ground motion. The importance of the existence at relatively small depth of an interface characterized by a strong contrast of *S* wave propagation velocity for the adjacent layers, in order to provide a strong and stable influence of local conditions upon the ground motion characteristics must be emphasized again. Otherwise, the need to examine the characteristics of deep geological profiles is necessary.

The importance of these aspects for the predictability of ground motion features and for microzonation studies is obvious.

Earthquake Engineering

The main directions of work in this field were:

- studies on non-linear behaviour of soils and site response
- studies on the seismic vulnerability of structures;
- modernization of design codes;
- studies on base isolation;

Studies on non-linear behaviour of soils and site response were presented in conferences (for example: Marmureanu,Gh., Cioflan,C.O.,Marmureanu,Alex.; *New seismic hazard map of Romania by probabilistic and deterministic approaches,linear and nonlinear analys*, Fourteenth European Conference on Earthquake Engineering,30 August-03 September 2010,Ohrid,Macedonia), journals (for example : Marmureanu, Gheorghe;Cioflan, Carmen Ortanza; Marmureanu, Alexandru; *INTENSITY SEISMIC HAZARD MAP OF ROMANIA BY PROBABILISTIC AND (NEO) DETERMINISTIC APPROACHES, LINEAR AND NONLINEAR ANALYSES*; Romanian Reports in Physics, Vol. 63, No. 1, P. 226–239, 2011) and research projects were completed.

The vulnerability studies were carried out essentially in analytical terms. Two main subjects were dealt with:

- Analysis of evolutionary vulnerability, mainly as a consequence of the cumulative effects of successive earthquakes;
- Vulnerability and risk analysis of multi-location systems, like lifelines, railway networks etc.

The studies on modernization of codes were intended mainly to adapt the codes for practice to the outcome of more consistent techniques of control of structural safety.

The studies on base isolation were oriented towards the analysis of specific criteria under the seismic conditions of Romania. An international symposium on this subject was organized in Bucharest in 2008. The papers presented were published in a volume, I. Lad, H. Sandi, U. Sannino, A. Martelli: *"Modern systems for mitigation of seismic action"*. AGIR Publishing House, Bucharest, 2009.

The studies on earthquake protection principles were devoted mainly to a critical analysis of the specific obstacles to the control and mitigation of seismic risk to structures.

Studies on base isolation were presented in some papers as:

- Dinu Bratosin, Florin-Ştefan Bălan, Carmen-Ortanza Cioflan, „*Multiple Resonances of the Site Oscillating Systems, Proceedings of the Romanian Academy"*, seria A: Mathematics, Physics, Technical Sciences, Information Sciences, Volume 11, Number 3, July-September 2010;
- H. Sandi and Ioan Sorin Borcia, *A summary of instrumental data on the recent strong Vrancea earthquakes, and implications for seismic hazard*; Pure and Applied Geophysics, Springer, June 2010;

and a project in NIRDEP was developed on the subject "Seismic risk reduction by avoidance of the site-structure resonance and by the seismic base isolation. Applicability from the Bucharest metropolitan zone"., financed by Romanian Government in the period 2008 – 2010.

A very important progress in the domain of changing theoretical and practical knowledge in the domain of engineering seismology was done in the framework of international project Black Sea Earthquake Safety Net(work) – ESNET (2012-2014) where participated specialists from 4 countries along the Black Sea coast, Republic of Moldavia (Institute of Geology and Seismology, Academy of Sciences), Romania (National Institute of Research Development for Earth Physics), Bulgaria (National Institute of Geophysics, Geodesy and Geography) and Turkey(International Blue Crescent Relief and Development Foundation, KOERI - Kandilli Observatory and Earthquake Research Institute National Earthquake Observation Centre). Subjects from engineering seismology were discussed during the project meetings and presented in a book written during the project.

In order to take advantage of the Romanian Seismic Network that comprise nowadays of more than 140 seismic stations in real-time, since 2006 NIEP implemented the ShakeMap software (developed by USGS) that enables the automatic generation of maps and data for instrumental intensity, PGA, SA or PGV. These outputs are highly important for authorities and the large public immediately after an earthquake, since they provides geographically hints regarding the possible distribution of effects and areas that have to be investigated. Currently the 3.5 version of ShakeMap is in use. For the Vrancea Area a special ground motion prediction equation (GMPE), developed by Sokolov et al[1], was implemented. The overall computation time is under 8 minutes for an event, for an area between 20°E - 29°E longitude and 43.5°N - 48°N latitude.

The Near Real-Time System for Estimating the Seismic Damage of Romania, implemented in 2012 at the National Institute for Earth Physics, is another automated systems that can directly contribute to saving many lives right after a major earthquake, by translating hazard and vulnerability parameters into damage probabilities for different areas within Romanian counties and showing emergency intervention necessities[2].

Currently, this system uses for building loss estimation the analytical methods (as the Improved-Displacement Capacity Method - I-DCM) implemented within the open-source software SELENA (SEismic Loss EstimatioN using a logic tree Approach), together with HAZUS methods for estimating the human casualties. The building stock is defined through 48 different capacity and fragility curves, depending on construction material, height and age. As hazard data, PGA and SA values obtained through the ShakeMap System and based on real recordings and attenuation relations are used. The area currently analyzed by the system consists of 19 Romanian Counties, capital Bucharest and 9 regions in northern Bulgaria; resolution of the data is at administrative unit (commune or city) level.

This system enabled also the analysis of Bucharest, one of the most vulnerable capitals in Europe due to earthquakes, to an even higher resolution extent, based on new census data. The recently published results[3] highlight the need of greater impact mitigation actions, since many casualties are expected to occur during a future major Vrancea earthquake.

Acknowledgements. *This report has been prepared by Prof. Dr. Horea Sandi, Dr. Stefan*

[1] Sokolov, V., Bonjer, K.P., Wenzel, F. (2004). Accounting for site effect in probabilistic assessment of seismic hazard for Romania and Bucharest: a case of deep seismicity in Vrancea zone. Soil Dynamics and Earthquake Engineering, Vol. 24, pp. 929–947

[2] Toma-Danila D., Cioflan C.O., Balan S.F., Manea E.F. (2015). Characteristics and results of the near real-time system for estimating the seismic damage in Romania, Mathematical Modelling in Civil Engineering, Vol. 11, No. 1, pp. 33-41

[3] Toma-Danila D., Zulfikar C., Manea E.F., Cioflan C.O. (2015). Improved seismic risk estimation for Bucharest, based on multiple hazard scenarios and analytical methods; Soil Dynamics and Earthquake Engineering, Vol. 73, pp. 1-16

Balan, Dr. Carmen Cioflan and PhD. Dragos Toma-Danila.

PART III: STRUCTURE OF THE LITHOSPHERE

Research activities regarding the lithosphere studies are carried out by the National Institute for Earth Physics, Department for Lithosphere structure.

The department for Lithosphere structure and dynamics is working since the INCDFP foundation, in 1994, and it has as principal goal the research of the lithosphere structure and dynamics at regional and local scale, employing seismic and seismologic methods. Subjects as dynamics of the lithosphere are also followed and study of the movements of the crust using GPS and satellite methods.

Main research directions of the department of Lithosphere structure and dynamics.

1. Lithosphere structure at regional and local scale;

Structure of the lithosphere in Romania; Moho depth in Romania;

New models at the geologic and tectonic scale.

2. Dynamics of the lithosphere by complex interpretation of the actual movements of the crust; physical properties of the rocks.

3. Studies of the crustal seismicity, seismotectonic models associated and assessment of the dynamic properties of the crust

Crustal seismicity;

Seismotectonic models;

Assessment of the dynamic properties of the crust in Romania;

Improvement of seismic hazard assessment;

Reduction of seismic risk

In the last years several studies about the natural hazard at a local scale were performed.

**4. Microzonation studies (local seismic hazard)
of densely populated areas**

Site effects analyses;

Advanced methodologies in processing of seismic refraction data;

Sharewave seismic velocity determination in Bucharest;

Local seismic hazard with special view to the Bucharest area.

Acknowledgements. *This report has been prepared by Dr. Andrei Bala*

PART IV. HEAT FLOW STUDIES

Geothermal modeling

Studies concerning the conversion procedure of seismic wave velocity, developed during the previous report time interval (2007-2011) for the Carpatho-Pannonian area, have been detailed for the southern part of the Neogene Volcanic Harghita Mountains (Tumanian, 2011). Also that type of studies have been extended to the Ionian/Adriatic plate (Tumanian et al., 2012).

Thermal models of the upper mantle in Italy and surroundings, along four geotraverses were presented, based on the assumption that the upper mantle seismic structure is controlled both by temperature and composition. The obtained results confirm the possibility to interpret the upper-mantle seismic models in terms of temperature and composition, and offer an enhanced insight into the geodynamic evolution, still in debate, of one of the most studied and geodynamically complex regions of Europe. Based on the thermal structure and melt distribution obtained, the following conclusions may be drawn: the ongoing subduction process of the Ionian/Adriatic plate (beneath Umbria, Calabria and the Aeolian arc), the latest episode of continental convergence (beneath Tuscany) and the thermal effect of the remnant of the Adriatic plate (Campania) leave distinctive signatures in the temperature's field of the shallow upper mantle. Despite the epistemic uncertainties in the temperature–seismic velocity conversion technique, which affect the thermal estimations, the temperature field characteristics seems to be in agreement with independent studies about the change of the slab structure along the Apennines chain, from north to south, due to fragmentation of Apennines' lithosphere with the gradual termination of active subduction: in the Northern Apennines the slab is almost horizontal, and underlies the chain and the uplift of Apennines is the result of the isostatic adjustment. In the Central Apennines the slab is almost vertically dipping and reaches depths of around 130 km, whereas beneath the Southern Apennines the slab reaches larger depths, its dynamics being controlled by roll-back and tearing processes. Temperature values at Moho are, in general, correlated with surface heat flow values in the Tyrrhenian Sea area and surroundings, even if most of the provinces of the study area (like Tuscan-Tyrrhenian area, Apennines and Adriatic trough) have not yet reached the steady-state thermal regime. The thermal gradients evaluated in Adria foreland are higher in comparison with those of the back-arc area (Tyrrhenian Sea) and they could be an effect of the eastward mantle flow beneath Adria lithosphere or a consequence of the presence of a low fraction of melts ≤ 1 wt.%, which cannot rise in the compressive regimes, or both. Melt fraction distribution in the back-arc area, corresponding to temperatures inferred by conversion technique, is approximately correlated with the age of the magmatism, the highest abundance occurring in the most active volcanism area in the southern Tyrrhenian sea.

Past climate changes inferred from geothermal measurements

Temperature data from nine boreholes in the Carpathian orogen in Romania have been used to obtain information on the ground surface temperature history (GSTH) in the last 250 years (Demetrescu et al., 2012). Long-term air temperature records available from the Romanian weather station network have been used as a comparison term for the first 100-

150 years of the GSTH, and as a forcing function in a POM-SAT model that combines borehole temperature profiles and meteorological time series to produce information on the so-called pre-observational mean (POM). Results from a global circulation model for the Romanian area have been used in the discussion as well.

Acknowledgements. This report was prepared by Dr. Crisan Demetrescu

PARTICIPATION OF THE ROMANIAN SPECIALISTS IN INTERNATIONAL AND NATIONAL PROJECTS OR PROGRAMMES

In the past four years the Romanian seismology has been actively contributing to:

(1) *world-wide interdisciplinary international research programs*, such as:

- **Romania's technical participation in support of the Comprehensive Nuclear-Test-Ban Treaty (CTBT).**

The National Institute for Earth Physics hosts the Romania's National Data Centre (NDC), with operates the seismic station Cheia-Muntele Rosu (MLR) for its uninterrupted participation to the global monitoring network of the verification system, and co-operates with national and international organizations for upgrading and maintaining. NDC receives and analyzed the data coming from MLR station and from the International Monitoring System, as well the products of the International Data Centre (IDC) from Vienna, Austria.

- **Seismic Hazard Harmonization in Europe – SHARE ,** FP7 Collaborative project No. 226967/2008 , 2009-2011

The project is coordinated by Switzerland (Prof. D. Giardini) and involves 18 partner institutes from Belgium, France, Germany, Greece, Italy, Norway, Portugal, Romania, Serbia, Switzerland, Turkey, United Kingdom. The main objectives is to build up an integrated hazard map at European scale, harmonizing and standardizing data and procedures across borders. The seismic source analysis and parameterization are essential inputs for the seismic hazard evaluation.

- **Danube Alert System for Earthquakes – DACEA**

Cross-border project No. 2 (1I) - MIS ETC 636, 2010-2012

A common Romania - Bulgaria project related to implement and operate an early earthquake system for the Danube cross-border area. A primary objective is to build and update a common, integrated data base and to characterize the seismogenic zones which affect the target area, the geological structure in the cross-border region and the attenuation of the seismic waves for seismic hazard and risk assessment.

- **"Set-up and implementation of key core components of a regional early-warning system for marine geohazards of risk to the Romanian-Bulgarian Black Sea costal area" (MarineGeoHazard),** mis etc code 641, 2010-2013

Coordinator: GeoEcoMar, Bucharest.

- **European Plate Observing System (EPOS), ESFRI Program, 2010-2014, INGV Rome**

- **Network of European Research Infrastructures for Earthquake Risk Assessment and Mitigation (NERA), 2010-2014, ETHZ-Orfeus**

• **Global Tsunami Informal Monitoring Service (GTIMS). Earthquake global monitoring for tsunami generation, for earthquakes with magnitude M ≥ 7, JRC, 2013-2014, ISPRA Italy**

• **Black Sea Earthquake Safety Net(work) - ESNET, Joint Operational Programme "BLACK SEA 2007-2013", 2012-2014.**

• **Assessment, STrategy And Risk Reduction for Tsunamis in Europe (ASTARTE), FP7-ENV-2013: 2013-2016**

Main objective: Coasts at threat in Europe: tsunamis and climate-related risks

Coordinator: Instituto Portugues do Mar e da Atmosfera

(2) ***bilateral cooperation:***

• **South Carpathian Project NERC Grant NE/G005931/1, 2009-2011, University of Leeds, UK**

Project funded by the UK Natural Environment Research Council, aimed at determining the lithospheric structure and geodynamical evolution of the South Carpathian orogen.
A network of 55 seismographs is temporarily deployed in cooperation with the University of Leeds in the western part of Romania, Hungary and north-eastern part of Serbia. The network covers the South Carpathians, the western part of the Moesian block and the eastern part of the Pannonian Basin.

• **The bilateral project on "Seismic microzoning of Bucharest"** with the University of Trieste (Italy) has the goal to estimate the ground motion parameters due to waves coming from complex seismic sources and propagating in highly realistic structural models to mitigate the seismic risk in Bucharest metropolitan area.

During several stays as visiting scientists at ICTP and DES - University of Trieste, a group of researchers from NIEP worked within different NATO and EC projects focused on Vrancea earthquakes and their implications to the seismic hazard using the deterministic method developed at DES – Trieste. Complex research on microzonation, seismic source and earthquake prediction (CN method) was carried out on this occasion.

• **The enhancement of the station Bucovina (BURAR) for signal detection and seismic phase identification at regional and teleseismic monitoring, AFTAC**

A bilateral cooperation between the National Institute for Earth Physics (NIEP) and the Air Force Technical Applications Center (AFTAC) of the United States of America started in 1999 aiming at installing and operating a seismic array in the northern part of Romania (Bucovina array). The array consists of 9 short-period stations and 1 broadband station and started to be fully operational in July 2002. Another bilateral cooperation (NIEP and the Geoforschungszentrum Potsdam - GFZ) has been active since 1999 for the operation of the broad-band station Cheia - Muntele Rosu (belonging to the GEOPHON network). An important upgrade of the Cheia – Muntele Rosu station, as well as of the National Data Centre in Bucharest has been done since 1999, involving both technical cooperation with the Government of Japan and technical assistance from the CTBT Organization. Hence, in the fall of 2001 a new seismic monitoring system was installed and is now fully operational, by recording continuous earth motion data at Muntele Rosu site and transmitting these data in real-time to the facilities in Bucharest, in the framework of the Japan International Cooperation Agency project „Technical Cooperation for Seismic Monitoring System in Romania". Also, during 2001-2002, the CTBT Organization has supported the site preparation works at the seismic station Muntele Roşu and supplied equipment for establishing reliable data communications links between the seismic station, the NDC and the International Data Centre from Vienna.

- **Research and development studies of seismic sources for regional and local data (FA7022-11-C-0015), 2011-2018 - AFTAC**

- **Operations and Maintenance Support for the Romanian Seismic Array, 2011-2018 - AFTAC**

- **Tectonic evolution and Seismic Hazard of the South Carpathians Region, 2011-2013, Royal Society, UK**

- **Bilateral cooperation Romania - Cyprus, Investigation of earthquakes signatures on the ionosphere over Europe, INES, 2014-2015.**

(3) ***national programs and projects for research and developement*****:**

NUCLEU Program
Complex research on the seismic risk evaluation and reduction on the Romanian Teritorry(CERRS)
Period: 2009 - 2015
Project manager: Marmureanu Gheorghe

Projects in the frame of PNCDI National Programme 2007 – 2016/PNII

- **Innovative devices and systems for building security in case of strong earthquakes.**
Period: 2008 – 2011/Project manager: Daniela Ghica

- **Complex exploration and surveillance of geophysical environment using advanced monitoring techniques and multiparametric analysis to detect precursory anomalies for crustal and subcrustal earthquakes**
Period: 2008 – 2011/Project manager: Moldovan Iren

- **Project EMMESLAB/2007**
Multidisciplinary evaluation of the seismic site effect upon the seismic zonation of the earthquake-endangered Bucharest Metropolitan area.
Project manager: dr. ing. *Andrei BALA*, senior research geophysicist.

- **Project SURIZO/2007**
Modelling of the seismic sources from eastern part of the Romanian territory for the evaluation of the seismic hazard.
Project manager: Drd. *Mihai Diaconescu*, research geophyisicist.

- **Proiect TEMERISC/2007**

INOVATIVE TECHNIQUES AND METHODOLOGIES TO EVALUATE THE NATURAL RISK HAZARD (EARTHQUAKES AND LANDSLIDES)
Project manager: dr. Dumitru Stanica, GEODIN.
Project responsible: dr. ing. *Raileanu Victor*, senior research geophysicist, NIEP.

- **Project SEISMIST/2007**

Fundamental Research of Historical Seismology and Paleoseismology needed for the assessment of long-term seismicity and seismic hazard
Project manager: Dr. ing. *Angela Constantin*, senior researcher geophysicist.

- **Project MACROSER/2007**

Seismic macrozoning of the territory of Romania, based on revalued macroseismic intensities corroborated with complex geological and geophysical data
Project manager: Dr. ing. *Aurelian Pantea*, senior researcher geophysicist.

- **Project VELOROM/2008 Geonomic characterization of the major tectonic units in Romania. Models of the distribution of the seismic waves velocities.**

Project coordinator: University of Bucharest.
Project responsible from NIEP: dr. ing. *Raileanu Victor*, senior research geophysicist, NIEP. More information can be found at www.infp.ro.

- **Study of local seismic effects by interdisciplinary research using equivalent linear and nonlinear modeling**

Period: 2008 – 2011/Project manager: Marmureanu Gheorghe

- Seismic noise: a usefull alternative for crust velocity structure determination in Romania, 2010-2012, UEFISCDI - PD
- Rapid determination of earthquake's magnitude for seismic risk evaluation and reduction, 2010-2012, UEFISCDI - PD
- Harmonization of Seismological and Seismic Engineering aproaches: Conting the seismicity of Romania for an adequate implementation of the seismic activity in the European Code EN 1998 - 1 used for the seismic projection of buildings (BIGSEES), Parteneriate, 2012-2015.
- Bridging the gap between seismology and earthquake engineering. From the seismicity of Romania towards refined implementation of seismic action of European Norm EN 1998-1 in earthquake resistant design of buildings, Contract 72/2012, 2012 – 2015,
- **Seismic Hazard Harmonization in Europe** (RO-SHARE), Contract 69-1EU / 06.05.2010, 2010 – 2012.
- European Plate Observing System Europene EPOS-RO, UEFISCDI
- Strategies and instruments for the seismic risk reduction (REAKT-RO), UEFISCDI
- Multidisciplanary complex system for monitoring clouds, aerosols and solar radiation in corelation with Vrancea seismic activity, AeroSolSys, 2013-2016, STAR
- Geospatial integrated techniques for seismic forecasting in Vrancea area -

VRAFORECAST, STAR

- Project DARING/2014 **Dams safety during large destructive earthquakes: evaluation, improvement, monitoring, warning and emergency action plans**
  Project manager: Dr. ing. *Iren Adelina Moldovan*
- Rapid early waring system for earthquakes in Romania (ResyR), 2012-2015, PN II
- Spaceborne Multiple Aperture Interferometry and Sequential Patterns Extraction Techniques for Accurate Directional Ground and Infrastructure Stability Measurements (DGI-SAR), 2011-2014, Parteneriate
- Physical-seismological integrated approaches for risk-prone zones considering results from seismic wave's propagation in nonlinear complex media, 2011-2014, TE, B. Apostol
- „Educational Seismic Network in Romania” (ROEDUSEIS), UEFISCDI, 2012 – 2015
- Mobile Earthquake Exposition Expozitie (MOBEE), PN II, 2014-2016.

PARTICIPATION OF THE ROMANIAN SPECIALISTS IN THE NATIONAL AND INTERNATIONAL SYMPOSIUMS AND CONFERENCES

Many of the results obtained by the Romanian seismologists in the past four years have been presented at a series of national and international meetings as follows:

2011

Workshop on “Mohorovicic discontinuity in the light of modern Earth physics”, 13 January 2011, Bucharest, National Institute for Earth Physics, Măgurele:
M. Radulian: *Seismicity in the crust*

EGU General Assembly 2011
B. Grecu, Y. Ren, D. Tataru, C. Neagoe, G. Stuart, G. Houseman, M. Radulian, V. Raileanu: *First results of seismic noise cross-correlations between Romanian permanent broadband network and temporary stations deployed in the western part of Romania*

F. Borleanu, M. Popa, M. Radulian, S. Baher: *Calibration of BURAR (Romania) seismic array to estimate location and magnitude for the events occurred in the East and Southeast part of the array*

B. Zaharia, E. Oros, G. Houseman, G. Stuart, M. Popa, M. Radulian: *Understanding lithospheric structure from local seismic tomography in western Romania*

STATSEI 7 - 7th International Workshop on Statistical Seismology, 25 - 27 May 2011, Greece - Thera (Santorini)
A. Bala, M. Radulian, B. Grecu, E. Popescu: *Source effects vs. site effects of Vrancea earthquakes recorded in Bucharest city, Romania*

National Simposyum of Geology and Geophysics, GEO-2011, 20-21 May 2011, Facultaty of Geology, University of Bucharest
Popescu E., Cioflan C.O., Radulian M., Placinta A.O., Moldovan I.A.: *Attenuation relations for maximum acceleration produced by Vrancea subcrustal earthquakes*

12th International Balkan Workshop on Applied Physics, 5-9 July 2011, Ovidius University, Constanta
E. Popescu. I.A. Moldovan, A.O. Placinta, M. Radulian, A.I. Muntean: *Source properties of the recent crustal earthquakes occurred in the South-Eastern part of Romania*

The 6th Congress of the Balkan Geophysical Society, Budapest, Hungary, 3rd-6th October, 2011
B. Grecu, D. Tataru, V. Raileanu, C. Neagoe: *Investigation of the noise cross-correlations at three Romanian broadband seismic stations*

3rd International Symposium on the Geology of the Black Sea Region, 2011
M. Diaconescu, Z. Malita: *Seismic Sources nn Black Sea Areal*

2012

EGU General Assembly, Vienna, 22-27 April 2012
I.A. Moldovan, A.S. Moldovan, A.O. Placinta, E.M. Takla, A.P. Constantin, E. Popescu: *Possible associations between long term anomalous geomagnetic variations, Vrancea (Romania) intermediate depths earthquakes and the solar activity for the last 15 years*

S. F. Balan, C. O. Cioflan, B. F. Apostol: *Soil Deposit Response due to Crustal Seismogenic Zone of Fagaras-Campulung, Romania*

M. Craiu, A .Craiu, Gh. Marmureanu, M. Radulian: *Reevaluation of earthquakes magnitude for the main seismic zones of Romania*

Gh. Marmureanu, C.O. Cioflan, A. Marmureanu: *Nonlinear seismology a reality. The quantitative data*

A. Marmureanu, C. Ionescu, L. Manea: *Towards a nationwide Early Warning System in Romania*

B. Grecu, C. Neagoe, D. Tataru, G. Stuart: *Background Noise Characteristics in the Western Part of Romania*

L. A. Ardeleanu: *Estimation of focal mechanism of low magnitude crustal earthquakes from Vrancea region*

S. F. Balan, B.F. Apostol, C.O. Cioflan: *Soil Deposit Response due to Crustal Seismogenic Zone of Fagaras-Campulung, Romania*

A. Bala, A. Aldea, S.F. Balan, C. Arion: *Geological and Geophysical Models Underneath Bucharest City Responsible for the Variability of Seismic Site Effects*

P.F. Biagi, F. Righetti, T. Maggipinto, L. Schiavulli, T. Ligonzo, A. Ermini, I.A. Moldovan, A.S. Moldovan, H.G. Silva, M. Bezzeghoud, M. Contadakis, D.N. Arabelos, T.D. Xenos, A. Buyuksarac: *The European Network for studying the radio precursors of earthquakes: the case of the May 19, 2011 Turkey earthquake (Mw=5.7)*

M. Y. Boudjada, I. Moldovan, K. Schwingenschuh, E. Al-Haddad, P.F. Biagi, M. Parrot: *Demeter/ICE Experiment: Study of low frequency transmitter intensity variations*

T. Maggipinto, P.F. Biagi, F. Righetti, L. Schiavulli, T. Ligonzo, A. Ermini, I.A. Moldovan, A.S. Moldovan, H.G. Silva, M. Bezzeghoud, M.E. Contadakis, D.N. Arabelos, T.D. Xenos, A. Buyuksarac: *The European Network for studying the radio precursors of earthquakes: Principal Component Analysis of LF radio signals collected during July 2009 - April 2011*

I.A. Moldovan, A.S. Moldovan, P.F. Biagi, C. Ionescu, K. Schwingenschuh, M.Y. Boudjada:

The Terminator Time in subionospheric VLF/LF diurnal variation as recorded by the Romanian VLF/LF radio monitoring system related to earthquake occurrence and volcano erruptions

E. Popescu, M. Radulian, M. Craiu, A. Craiu, I. A. Moldovan, A. O. Placinta: *Source characteristics of the crustal moderate earthquakes occurred between 2007 and 2011, in the South Carpathians and Romanian Plain*

E. Popescu, A. Craiu, M. Craiu, M. Popa, and M. Radulian: *Earthquake sequence in western Getic Depression (Romania), December 2011 - January 2012: source characteristics and seismotectonics*

Y. Ren, B. Grecu, G. W. Stuart, G. A. Houseman, C. Ionescu, E. Hegedus, S. Radovanovic and South Carpathian Project Working Group: *Ambient noise tomography in the Carpathian-Pannonian region*

M. Rogozea, Gh. Marmureanu, M. Radulian: *Reevaluation of the macroseismic effects of the 23 January 1838 Vrancea earthquake*

D. Tataru, G. Stuart, B. Grecu: *Revealing the crust of western Romania using CCP techniques*

SSA Annual Meeting, 17-19 April 2012, San Diego, California
Apostol A., Moldovan I. A., Ionescu C., Zugrăvescu D.: *Stress Forecasting in Vrancea Seismically Active Region of Romania*

The First International Conference on MOLDAVIAN RISKS – FROM GLOBAL TO LOCAL SCALE, 16-19 May 2012, Bacău
A. Ismail-Zadeh, L. Matenco, M. Radulian, S. Cloetingh, G.F. Panza: *Geodynamics and Intermediate-Depth Seismicity in Vrancea*

M. Radulian, N. Mândrescu: *Seismogenic zones and seismic hazard at local and regional scales in Moldavia*

Gh. Mărmureanu: *Essential tools to mitigate of Vrancea strong earthquakes on Moldavian urban environment*

D. Toma: *A seismic risk analysis for Vrancea and Bacau counties, based on Selena and GIS software*

NATO Seminar on Science for Peace, 20 - 26 May 2012, Istanbul
M. Radulian: *Participation of the National Institute for Earth Physics to NATO Collaborative Activities*

Workshop of the International School of Geophysics and First EPOS - ORFEUS Coordination Meeting, Erice, 29 May - 1 June 2012
A. Bălă: *Geological and geophysical models underneath Bucharest city responsible for the variability of the seismic site effects*

European Congress on "Geoscientific Cartografy and Information Systems", Bologna, Italy, 12-15 June 2012
S. F. Balan, B. F. Apostol, C.O. Cioflan, J. R.R. Ritter: *New urban geology information using geotechnical tests data for the improvement of microzonation studies in Bucharest city area*

Romanian Insurance Conference, 13 June 2012, Bucharest
M. Radulian: *Exposing Romania to natural disasters*

Anual Scientific Conference of the Faculty of Phisics, 22 June 2012, Bucharest
F. Borleanu, M. Popa, B. Grecu, M. Radulian: *Discrimination of quarry blasts from*

earthquakes using data recorded by the BURAR (Romania) seismic array

The 8th General Conference of Balkan Physical Union, Constanţa, 5-7 July 2012
Moldovan I. A., Apostol A., Placinta A. O., Constantin A.: *The bio-location method used for stress forecasting in Vrancea (Romania) seismic zone*

Moldovan I. A., Moldovan A. S., Constantin I., Plăcintă A. O.: *The correlation of VLF/LF electromagnetic waves diurnal variation, as recorded by the Romanian VLF/LF radio monitoring system, with earthquake occurrence and volcano erruptions*

National Physics Conference, Constanta, 8-10 July 2012
I.A. Moldovan, A.P. Constantin, E. Popescu: *Probabilistic seismic hazard assessment in Romania: application for crustal and intermediate seismic active zones*

E. Popescu, A. Craiu, M. Diaconescu, M. Popa, M. Radulian, I.A. Moldovan: *Recent seismic activity in the western Getic Depression (Romania): Seismotectonics and source properties*

The 34-th International Geological Congress, Brisbane, Australia, August 2012
Oaie G., Rangulov B., Dimitriu R., Dimitrov O., Dobrev N., Diaconescu M.: *MARINEGEOHAZARD- Implementation of a real time regional warning system concerning marine geohazard for the western part of Black Sea*

ESC, Moscova 2012
E. Popescu, A. Craiu, M. Diaconescu, M. Radulian: *Seismicity and source investigation for the earthquake sequence occurred in the western Getic Depression (Romania), December 2011- January 2012*

F. Borleanu, B. Grecu, M. Popa, M. Radulian: *Crustal velocity structure for different profiles in Romania as revealed by inversion of surface waves*

C. Ionescu: *An Earthquake Early Warning System for border area Romania –Bulgaria*

M. Popa, M. Radulian, B. Zaharia: *Specific patterns in seismicity and lithosphere structure around Vrancea source: New insights in the continental collision geodynamics*

A.T. Ismail-Zadeh, L. Matenco, M. Radulian, S. Cloetingh, G.F. Panza: *Geodynamics, intermediate-depth seismicity and seismic hazard in the South-Eastern Carpathians*

M. Craiu, A. Craiu, C. Ionescu, M. Radulian: *Reevaluation of earthquakes magnitude for the crustal seismic zones of Romania*

M. Rogozea, M. Radulian, M. Popa, N. Mandrescu: *Large and moderate historical earthquakes of 15th and 16th centuries in Romania reconsidered*

M. Rogozea, M. Radulian, Gr. Marmureanu, D. Toma: *The most important historical earthquakes in Romania occurred from XVIII century to XIX century*

NDC Evaluation Workshop of the CTBTO, Asuncion - Paraguay, 29 September - 6 October 2012
D. Ghica, M. Popa: *Romanian NDC contribution to the verification activities carried out in support of CTBT monitoring during 2006 - 2011*

EMSEV 2012, October 1 - 4, 2012, Gotemba, Japan
Moldovan I.A., Toader V.E., Moldovan A.S., Ghica D.: Anomalies observed in VLF and LF radio signals on the occasion of the western Turkey earthquake (Mw=5.7) at May 19, 2011

ORFEUS Observatory Coordination Workshop, 11 - 15 November 2012, Istanbul
C. Neagoe: *National Seismic network of NIEP*

AGU Falling Meeting, San Francisco, December 2012
Stuart G., Houseman G., Kendall J-M, Ren Y., Hegedüs E., Ionescu C., Radovanovic S.: *Seismic anisotropy and mantle flow in Central Europe (T11B-2555)*

Destination Europe, San Francisco, 4 - 8 December 2012
M. Radulian: *Institute's Presentation*

The 8th International Conference on Geo-information for Disaster Management, Enschede, Olanda, 12-15 decembrie 2012
D. Toma: *Transport network vulnerability assessment methodology, based on the cost-distance method and GIS methodology*

2013

Safe and Efficient Shale Gas Exploration and Production Amsterdam, the Netherlands, 7 - 8 March 2013
A. Bala: *Prospecting for Shale gas in two perimeters in Romania*

EGU General Assembly, Vienna, 7 - 12 April 2013
F. Borleanu, M. Popa, E. Popescu, M. Radulian: *Applying full waveform inversion algorithm to compute focal mechanisms and magnitudes of shallow earthquakes in several seismic regions of Romania*

F. Borleanu, E. Popescu, M. Diaconescu, M. Radulian: *Location and source properties for the earthquake sequence occurred in the Western Getic Depression (Romania), December 2011 - January 2012*

Tataru D., Ionescu C., Zaharia B., Grecu B., Tibu S., Popa M., Borleanu F., Toma D., Bican-Brisan N., Georgescu E.S. Dobre D., Dragomir C.: *Romanian Educational Seismic Network Project*

D. Ghica, I. Stancu, C. Ionescu: *Seismo-acoustic analysis of the near quarry blasts using Plostina small aperture array*

B. Grecu, D. Ghica, I. Moldovan, C. Ionescu: *Seismo-acoustic analysis of thunderstorms at Plostina (Romania) site*

Ren, Y., Stuart, G., Houseman, G., Grecu, B., Ionescu C., Hegedüs, E., Radovanovic S., Shen Y., and South Carpathian Project working group: *Geodynamical Interpretation of Crustal and Mantle Shear-Wave Velocity Structures Beneath the Carpathian-Pannonian Region*

A. P. Constantin, A. Pantea, R. Stoica: *Contributions to the study of the two Vrancea (Romania) earthquakes in the 19th century: new sources*

A. P. Constantin, A. Pantea: *Abnormal animal behavior prior to the Vrancea (Romania) major subcrustal earthquakes*

I.A. Moldovan, V.E. Toader, A.O. Placinta, A.P. Constantin, E. Popescu: *Cross-correlation of solar activity with seismicity and electro-magnetic disturbances in Vrancea (Romania) source zone*

Balan S.F., Cioflan C.O., Apostol B.F., Malita Z., Toma-Danila D.: *Local effects induced by crustal seismogenic zone of Banat, Romania*

Marmureanu Gh., Cioflan C.O., Mărmureanu A., Apostol B.F.: *How long time will we go with linear seismology?*

I. Georgiev, A. Ganas, M. Radulian, V. Kotzev, E. Kostopoulos, E. Skassis, D. Dimitrov, R. Pachalieva: *Six years analysis of HemusNET permanent GPS network data – impact on geodynamics of the Balkans*

Ardeleanu L.: *Depth-dependent Q-models for the crust in the Vrancea region and surroundings by high frequency waveform modelling*

Moldovan I.A., Toader V.E., Nenovski P., Biagi P.F., Maggipinto T., Moldovan A.S., Ionescu C.: *Subionospheric VLF/LF radio waves propagation characteristics before, during and after the Sofia, Bulgaria Mw = 5.6 earthquake occurred on 22 May 2012*

Biagi P.F., Maggipinto T., Schiavulli L., Ligonozo T., Ermini A., Martinelli G., Moldovan I.A., Silva H.G., Bezzagoud M., Contadakis M.E., Arabelos D.N., Franztis X., Katzis K., Buyuksarac A., S'Amico S.: *The European VLF/LF Radio Network: Advances and recent results*

Apostol A., Moldovan I.A.: *Bio-location for stress forecasting in Vrancea seismically ative region*

SCP Seminar, 25 April, Universitaty of Leeds
M. Radulian: *Seismicity patterns in the upper mantle beneath South-Eastern Carpathians and geodynamic features (invitată)*

4th International Geoscience Student Conference, 25-28 April 2013, Berlin
A. Opriş: *SKS splitting observed at Slovenian Seismic Network*

SE-EEE Conference, Skopje, Macedonia, 28 May – 2 June 2013
Marmureanu Gh., Cioflan C.O., Marmureanu A., Ionescu C.: *Non Linear Seismology a Reality. The implications in Engineering*

Vacareanu R., Lungu D., Aldea A., Demetriu S., Arion C., Neagu C., Pavel F., Marmureanu Gh., Cioflan C.O.: *Statistics of seismicity for Vrancea subcrustal seismic source*

ARISE OHP Training School, 3 - 5 June 2013, Observatoire de Haute-Provence, St. Michel l'Observatoire, France
D. Ghica, C. Ionescu, B. Grecu: *Use of the Plostina infrasound array to monitor extreme events*
generated by natural and anthropogenic acoustic source

Seminar on "Numerical modelling using high performance computing infrastructures, 10 - 11 June 2013, Bucharest
M. Radulian, O.F. Cărbunar: *Numerical simulation of specific seismicity patterns in the Vrancea region, Romania*

International Multidisciplinary Scientific GeoConference SGEM, 16 - 22 June 2013 Albena, Bulgaria
Zaharia B., Tataru D., Grecu B., Ionescu C., Tibu S., Bican-Brisan N., Georgescu E.S.: *Romanian Educational Seismic network: educational tool for increasing awarness of seismic risk*

2013 CTBT Science and Technology, 17 - 21 June 2013, Vienna, Austria
F. Borleanu, M. Popa, B. Grecu, M. Radulian: *Quarry Blast Discrimination for the Events Near BURAR Array (Romania) Using Different Specific Techniques*

D. Ghica, M. Popa: *Romanian NDC contribution to the regional operational system in support of CTBT monitoring during 2012*

D. Ghica, B. Grecu, I. Moldovan, V. Toader, C. Ionescu: *Detection capability of the Plostina infrasound array using well-characterized events*

Anual Scientific Session of the Faculty of Physics, 21 June 2013, Bucharest
M. Radulian, E. Popescu, F. Borleanu, M. Diaconescu: *Source parameters for the December 2011 - January 2012 seismic sequence in the Southern Carpathians, Romania*

International Multidisciplinary Scientific GeoConference SGEM, 16-22 June 2013 Albena, Bulgaria
Zaharia B., Tataru D., Grecu B., Ionescu C., Tibu S., Bican-Brisan N., Georgescu E.S.
Romanian Educational Seismic network: educational tool for increasing awarness of seismic risk

The 13th International Balkan Workshop on Applied Physics and Materials Science, 4 -6 July 2013, Constanta, Romania
Tataru D., Zaharia B., Grecu B., Ionescu C.: *National Institute for Earth Physics – Education and Public Outreach Activities*

I.A. Moldovan, V.E. Toader, A.S. Moldovan, D.V.Ghica: *Testing the infrasound method on the Black Sea coast*

I.A. Moldovan, V.E. Toader, E. Popescu, A. O. Placinta, A. P. Constantin: *The effect of solar storms on seismic and geomagnetic activity as recorded in Vrancea seismogenic area*

IAHS - IAPSO - IASPEI Joint assembly of "Knowledge for the Future", 22 - 26 July 2013, Gothenburg, Sweden
Borleanu F., Popa M., Radulian M.: *Detection performance of BURAR (Romania) seismic array after its upgrading in 2008*

D. Ghica, M. Popa, C. Ionescu: *The new Plostina seismic array (Romania)*
M. Rogozea, M. Radulian, D. Toma, N. Mandrescu: *Reevaluation of the most important*

earthquakes produced in Romania in 18th century

Marmureanu Gh., Marmureanu A., Cioflan C.O.: *Nonlinear seismology the actual one in this Century*

Apostol A., Moldovan I.A., Balan S.F.: *Physical aspects of earthquake preparation, deformation and stress forecasting for Vrancea (Romania) seismic source*

Vienna Congress on Recent Advances in Earthquake Engineering and structural Dynamics (VEESD), 27 - 30 August, 2013, Vienna

Marmureanu Gh., Marmureanu A., Cioflan C.O.: *The particularities of spectral responses by considering strong nonlinear behavior of soil used in NPP Cernavoda (Romania) Stress Test evaluation*

Infrasound Technology Workshop 2013, Vienna International Centre, 5 - 11 October 2013, Vienna, Austria

D. Ghica: *The Romanian Plostina Infrasound Array*

International School and Workshop on Nonlinear Mathematical Physics and Natural Hazards Noiembrie 2013, Bulgaria, Sofia

Nastase E.: *The NIEP network of permanent GPS stations*

Manea E. F., Toma-Danila D., Cioflan C.O., Marmureanu Gh., Radulian M., Balan S.F.: *Steps in seismic risk mapping for Romania capital city*

C.Ionescu, A.Marmureanu, Gh.Marmureanu: *Romanian-Bulgarian Rapid Early Warning System (REWS)*

G.Marmureanu, C.O.Cioflan, Al.Marmureanu, C.Ionescu: *Nonlinear Seismology the Actual Seismology in this Century*

M. Popa: *Romanian Network for Seismic and Crustal Movement Monitoring*

M. Radulian, O.F. Cărbunar: *Nonlinear dynamics in Vrancea source: numerical simulation*

INSPIRE Conference 2013: The green renaissance (Florence, Italy, 2013)

Balan S.F., Apostol B.F., Toma-Danila D.: *Complex Researches and Monitoring for the Mitigation of Seismic Risk of Bucharest Area*

Environmental (SC5), Info-day, 28 November, Ion Mincu University of Arhitecture, Bucharest

A. Bala: *Participation of National Institute for Earth Physics at international projects in 2013*

MARINE GEOHAZARD FINAL MEETING

M. Diaconescu: *Implementation of a real time regional warning system concerning marine geohazard for the western part of Black Sea. Seismic sources.*

2014

2nd ARISE Workshop - 25 - 27 March 2014, Florence, Italy

D. Ghica, C. Ionescu: *The upgraded Romanian infrasound array*

EGU General Assembly, Vienna, 27 April – 2 May 2014

P. F. Biagi, T. Maggipinto, L. Schiavulli, T. Ligonzo, R. Colella, A. Ermini, G. Martinelli, P. Palangio, I. A. Moldovan, H. Silva, M. Contadakis, X. Frantzis, K. Katzis, A. Buyuksarac, S. D'Amico: *The European VLF/LF Radio Network: the current status*

V. E. Toader, I. A. Moldovan, C. Ionescu: *Complex monitoring and alert network for electromagnetic, infrasound, acoustic seismotectonic phenomena*

Constantin Ionescu, Raluca Partheniu, Carmen Cioflan, Angela Constantin, Anton Danet, Mihai Diaconescu, Daniela Ghica, Bogdan Grecu, Liviu Manea, Alexandru Marmureanu, Iren Moldovan, Cristian Neagoe, Mircea Radulian, Victor Raileanu, and Ioan Verdes *Tsunami early warning system for the western coast of the Black Sea, EGU2014-3569, Session NH5.6*

Tommaso Maggipinto, Roberto Colella, Pier Francesco Biagi, Luigi Schiavulli, Teresa Ligonzo, Anita Ermini, Giovanni Martinelli, Paolo Palangio, Iren A. Moldovan, Hugo G. Silva, Mourad Bezzeghoud, Michael E. Contadakis, Dimitrios N. Arabelos, Emmanuel M. Scordilis, Xenophon Frantzis, Konstantinos Katzis, Aydın Buyuksarac, and Sebastiano D'Amico *Pre-seismic radio anomaly observed on the occasion of the MW=6.5 earthquake occurred in Crete on October 12, 2013, EGU2014-3683 , Session NH4.3*

Iren-Adelina Moldovan, Victorin Emilian Toader, and Adrian Septimiu Moldovan, *High amplitude continous infrasonic signals recorded on the Romanian Black Sea coast, EGU2014-5087, Session AS4.6*

Iren-Adelina Moldovan, Angela Petruta Constantin, Victorin Emilian Toader, Dragos Toma-Danila, Pier Francesco Biagi, Tommaso Maggipinto, and Paul Dolea, *The development of the International Network for Frontier Research on Earthquake Precursors (INFREP) by designing new analysing software and by setting up new recording locations of radio VLF/LF signals in Romania, EGU2014-5206, Session NH4.3*

Emilia Popescu, Anca Otilia Placinta, Felix Borleanu, Mircea Radulian, and Iren Adelina Moldovan, *Source characteristics of the recent crustal earthquakes occurred in the Romanian Carpathians, EGU2014-5345, Session SM2.2/NH4.9/TS5.6*

Mihail Diaconescu, Iren-Adelina Moldovan, and Angela Petruta Constantin, *Crustal seismicity of the Black Sea areal, EGU2014-6138, Session NH5.1*

Marius M. Echim, Iren Moldovan, Mirela Voiculescu, George Balasis, Janos Lichtenberger, Balazs Heilig, and Peter Kovacs , *Electric, Magnetic and Ionospheric Survey of Seismically Active Regions with SWARM EGU2014-11301, Session EMRP2.5/ESSI1.13/G6.10/GD4.3/PS1.4/ST2.5*

Maria Ana Baptista, Ahmet Yalciner, Miquel Canals, Joern Behrens, David Fuhrman, Mauricio Gonzalez, Carl Harbitz, Utku Kanoglu, Nurai Karanci, Franck Lavigne, Stefano Lorito, Mustafa Meghraoui, Nikolaos S. Melis, Ocal Necmioglu, Gerassimos A. Papadopoulos, Alexander Rudloff, François Schindele, Pedro Terrinha, Stefano Tinti, and the ASTARTE Team, *Improving Tsunami Resilience in Europe – ASTARTE, Session NH5.1*

Ardeleanu L., Neagoe C., *The performance of the stations of the Romanian seismic network in monitoring the local seismic activity.*

Felix Borleanu, Emilia Popescu, Mircea Radulian, Mihai Diaconescu, *December 2011 - January 2012 seismic sequence in Southern Carpathians, Romania – EGU 2014.*

International Multidisciplinary Scientific GeoConference SGEM - Albena 2014
Andrei Bala, *Improved methodology towards a quantitative assessment of site effects employing geophysical and seismological data.*
Andrei Bala, Dieter Hannich, Dominik Ehret, Gerhard Huber, *Liquefaction probability in Bucharest and influencing factors.*

Second International Conference on NATURAL AND ANTHROPIC RISKS ICNAR2014, 04-07 June 2014, Bacau, Romania:
Andrei Bala, *Optimized methodology towards a quantitative assessment of site effects*

1st National Conference on Earthquake Engineering and Seismology, 19 - 20 June 2014
Ardeleanu L., Neagoe C., *The performance of the stations of the Romanian seismic network in monitoring the intermediate depth seismic activity of Vrancea region.*
R. Partheniu, M. Diaconescu, B. Grecu, C. Ionescu, C. Neagoe, A. Marmureanu, I. Verdes *Earthquakes and tsunamis monitoring in the western Black Sea area*

M. Diaconescu, D. Toma, A. Craiu, *Evaluation of tsunamogenetic potential of seismic sources from Black Sea and surrounding areas*

E. Nastase, M. Alexandra, C. Ionescu
Analysis of geodynamic zones in Romania by satellite geodesy

E. Popescu, A.O. Placinta , F. Borleanu, M. Radulian, I. A. Moldovan,
Source properties of recent crustal earthquake sequences occurred in the Romanian Carpathians

D. Bratosin, G. Marmureanu, F.S. Balan
Resonance in the nonlinear site-structure oscillating system

E. Oros, M. Diaconescu
Recent vs. historical seismicity analysis for Banat seismic region (western part of Romania)

G. Marmureanu, C.O. Cioflan,A. Marmureanu, E. Manea, *Nonlinear seismology - a reality. Bridging the gap between this reality and earthquake engineering*

D. Tataru, C. Ionescu, F.S. Balan, B. Zaharia, B. Grecu, *Earth science education and outreach activities as part of a new generation of projects*

I.A. Moldovan, A. Constantin, E. Popescu, A.O. Placinta, D.T. Danila, *Seismic hazard and risk studies for large Romanian dams situated in the western part of Romania*

T. Kronrod, M. Radulian, G.F. Panza, A. Peresan, *The macroseismic data set and isoseismals for the strongest Vrancea earthquakes*

B. Grecu, *Ambient seismic noise studies in Romania: an overview*

D.T. Danila, C.O. Cioflan, S.F. Balan, E.F. Manea, *Characteristics and results of the near real-time system for estimating the seismic damage of Romania*

„Anual Scientific Session of the Faculty of Physics, University of Bucharest", 19 - 20 June 2014:
I.A. Moldovan, V.E. Toader, A.P. Constantin, D. Ghica, *Infrasonic monitoring of the Romanian Black Sea coast*

A.O. Placinta, E. Popescu, M. Radulian, F. Borleanu, M. Diaconescu, *Source parameters for earthquake sequence occurred in the BURAR area (Romania) between 24 and 30 June 2011 - Fizica 2014*

I. Stancu, Daniela Ghica, M. Radulian, *Monitoring atmospheric phenomena severe nature using seismo-acoustic network of Plostina, Romania*

Maria Rogozea, M. Radulian, Mihaela Popa, D. Paulescu, R. Glavceva, N. Mandrescu, *Investigation of historical earthquakes of 14 October 1892 and 31 March 1901*

Alexandra Muntean, E. Nastase, C. Ionescu, V. Mocanu, Boudewijn A. C. Ambrosius, *GNSS technology and its application in various research areas in Romania*

Andreea Craiu, M. Craiu, A. Marmureanu, M. Diaconescu, *Seismic activity in the last five years and focal mechanisms analysis of the main seismic areas of Romania*

D. Paulescu, Maria Rogozea, M. Radulian, Mihaela Popa, *Database management and development of instrumental recordings of historical earthquakes in Romania*

„The 14th International Balkan Workshop on applied Physics", IBWAP, 2 - 4 July 2014, Constanta

Iren-Adelina Moldovan, Dragos Toma-Danila, Angela Petruta Constantin, Mihaela Popa, Victorin Emilian Toader, Anica Otilia Placinta, Adrian Septimiu Moldovan, *Cross correlation of VLF/LF radio propagation paths and the European seismicity*

Mihail Diaconescu, Angela Petruta Constantin, Iren Adelina Moldovan, Dragos Toma Danila, *Seismicity Of The Eastern Part Of The Moesian Platform*

Angela Petruta Constantin, Mihail Diaconescu, Iren Adelina Moldovan, *Macroseismic Study Of Major Transborder Historical Earthquake,*

V.E. Toader, Iren Adelina Moldovan, C. Ionescu, *Complex Monitoring And Alert System For Seismotectonic Phenomena,*

„Second European Conference on Earthquake Engineering and Seismology (2ECEES) , Istanbul, Turkey, 24-29 August, 2014 ESC

Mihail Diaconescu, Andreea Craiu, Dragos Toma-Danila And Angela Petruta Constantin, *Seismicity of east Moesian Platform*

Iren-Adelina Moldovan, Angela Constantin, Emilia Popescu, Dragos Toma-Danila, Victorin Emilian Toader, Traian Moldoveanu And Anica Placinta; *Seismic hazard and risk studies for large Romanian dams situated on Bistrita and Siret rivers,*

Andrei Apostol, Iren-Adelina Moldovan, Angela Petruta Constantin, And Victorin Emilian Toader;*Are red wood ants earthquake predictors?*

Angela Petruta Constantin, Iren-Adelina Moldovan And Victorin Emilian Toader;*Depth and magnitude estimation of the two strongest earthquakes occurred on the Romanian territory in 19th century*

Victorin Emilian Toader, Iren - Adelina Moldovan, Constantin Ionescu.*Earthquake forecasting using acoustic waves*

Craiu A., Ardeleanu L., Diaconescu M., Craiu M., Ionescu C., *2013 seismic swarm recorded in Galati area, Romania - focal mechanism solution.*

Andrei Bala, *Optimized methodology towards a quantitative assessment of site effects employing geophysical and seismological data*

„International Workshop on Electromagnetic Phenomena Associated with Earthquakes and Volcanoes", Konstancin Jeziorna, Poland, 22 - 26 September 2014
Victorin-Emilian Toader, Iren-Adelina Moldovan, Constantin Ionescu, *Multidisciplinary analysis of earthquake preparatory processes;*

Iren-Adelina Moldovan, Victorin Emilian Toader, Angela Petruta Constantin, Dragos Toma-Danila, Pier Francesco Biagi, Adrian Septimiu Moldovan**,** *Proposal for INFREP development for a better correlation of VLF/LF radio propagation paths with the European seismicity.*

International Conference on Environmental Legislation, Safety Engineering and Disaster Management (ELSEDIMA), 18 - 19 September 2014, Cluj-Napoca.
M. Popa si M. Radulian
"Management of earthquakes in Romania - National Institute for Earth Physics strategy"

- **Scientific Session GEO 2014, 21 November 2014, Bucharest**

E. Popescu, A.O. Placinta , F. Borleanu, M. Radulian, I.A. Moldovan, *Source properties of recent earthquake sequences occurred in the Carpathians area, in Romania*

PUBLISHED PAPERS 2011-2014

2011

Ardeleanu L., Reliability of source parameters of low magnitude crustal earthquakes of Vrancea retrieved by high frequency waveform inversion, *Rom. J. Phys.*, vol. 56, 827-841, 2011.

Ardeleanu L., Răileanu V., The focal mechanism of low magnitude subcrustal earthquakes of Vrancea retrieved by high frequency waveform inversion, *Rom. Rep. Phys.*, vol. 63, nr. 2, 2011.

Bălan S. F., Apostol B. F., Modeling geodynamical parameters for seismic local effects estimation. Example for Galaţi and Tecuci seismic areas, *Rom. Reps. Phys.*, vol. 63, 240-249, 2011.

Bălan S. F., Apostol B. F., Studies of urban seismology in Bucharest, *Rev.Roum, Geophys.*, in press.

Bălan S. F., Ritter J., Researches of urban seismology in Bucharest, ECBR Workshop: European and Mediterranean major hazards agreement (EUR-OPA) of the Council of Europe – priorities for reducing disasters impact in Europe and Romania. Projects of ECBR – European Center for Buildings Rehabilitation within NRDI urban INCERC, Bucharest. September 23, 2011, p. 32, rezumat in brosura.

Bălă A., Hannich D., Ritter J.R.R., Ciugudean – Toma V., Geological and Geophysical Model of the Quaternary Layers based on *in situ* measurements in Bucharest, Romania, *Romanian Reports in Physics*, vol. 63, 250-274, 2011.

Bălă A., Ritter J.R.R., Bălan S. F., Hannich D., Assessment of the seismic site effects based on earthquake recordings and *in situ* borehole measurements in Bucharest, Romania, SGEM 2011, 11-th International Multidisciplinary Scientific GeoConference, Conference Proceedings, vol. 1, 379-386, ISSN 1314-2704, DOI: 10.5593/sgem2011.

Bălă A., Aldea A., Grecu B., Hannich D., Methods to Assess the Site Effects in Bucharest City, Romania, SGEM 2011 , 11-th International Multidisciplinary Scientific GeoConference, Conference Proceedings, vol. 1, 553 - 560.,ISSN 1314-2704, DOI: 10.5593/sgem2011.

Biagi, P. F., Maggipinto, T., Righetti, F., Loiacono, D., Schiavulli, L., Ligonzo, T., Ermini, A., Moldovan, I. A., Moldovan, A. S., Buyuksarac, A., Silva, H. G., Bezzeghoud, M., and Contadakis, M. E.: The European VLF/LF radio network to search for earthquake precursors: setting up and natural/man-made disturbances, *Nat. Hazards Earth Syst. Sci.*, 11, 333-341, doi:10.5194/nhess-11-333-2011.

Borleanu F., Popa M., Radulian M., Schweitzer J., Slowness and azimuth determination for Bucovina array (BURAR) applying multiple signal techniques, *Journal of Seismology*, DOI 10.1007/s10950-011-9228-9, 2011.

Cărbunar O. F., Radulian M., Geometrical constraints for the configuration of the Vrancea (Romania) intermediate-depth seismicity nest, *Journal of Seismology*, 15, 579-598, 2011.

Cioflan C. O., Mărmureanu A., Mărmureanu G., The quantitative evidence of the soil nonlinear behavior during of strong Vrancea earthquakes in real / nonlinear seismology, *Romanian Reports in Physics*, 63, 839-851, 2011.

Constantin A. P., Pântea A., Stoica R., Vrancea (Romania) subcrustal earthquakes: historical sources and macroseismic intensity assessment, *Romanian Journal of*

Physics, 56, 813–826, 2011.

Diaconescu M., Maliţa Z., Seismic sources in the Black sea area, in Abstract suplement to Geoecomarina no.17/2011, 55-58, 3rd International Symposium on the Geology of the Black Sea Region, Bucharest, 1-10 October 2011

Diaconescu M., Maliţa Z., Cutremure dobrogene, Ed. Granada, 130 pg, cod CNCSIS 332-2009, ISBN 978-973-8905-96-2, 2011.

Enescu B., Enescu D., Ito K., Values of b and p: their variations and relation to physical processes for earthquakes in Japan and Romania, *Rom. Journ. Phys.*, 56, 590-608, 2011.

Ghica D., Detection capabilities of the BURAR seismic array-contributions to the monitoring of regional and distant seismicity, *Journal of Seismology*, 15, 487-506, 2011.

Grecu B., Răileanu V., Bălă A., Tătaru D., Estimation of site effects in the Eastern part of Romania on the basis of H/V ratios of S and coda waves generated by Vrancea intermediate-depth earthquakes, *Rom. Journ. Phys.*, 56, 563-577, 2011.

Grecu B., Tătaru D., Răileanu V., Neagoe C., Investigation of the noise cross-correlations at three Romanian broadband seismic stations, Proceedings of of the 6th Congress of the Balkan Geophysical Society, P28, 2011.

Ivan M., Cormier V. F., High frequency PKKPbc around 2.5 Hz recorded globally, *Pure Appl. Geophys.*, 168, 1759-1768, 2011.

Ivan M., Crustal thickness in Vrancea area, Romania from S to P converted waves, *Journal of Seismology*, 15, 317-328, 2011.

Mateciuc D., Particularitatile deplasarilor tridimensionale in zona seismica Vrancea din date satelitare GPS, Monitorul de Petrol si Gaze, 4/2011, ISSN 1583-0322, 37 – 42pp, 2011.

Mateciuc D., *Contributions to crustal deformation field knowledge in Romania*, Ed. Tehnopress, Iasi, ISBN 978-973-702-872-3, 163pp., 2011.

Mateciuc D., Maliţa Z., Some aspects on Vrancea area seismicity and focal mechanisms - particularities of associated earthquakes., part I (in Romanian), Monitorul de Petrol si gaze, 7/2011, ISSN 1583-0322, 56 – 59pp, 2011.

Mateciuc D., Maliţa Z., Some aspects on Vrancea area seismicity and focal mechanisms - particularities of associated earthquakes., part II (in Romanian), Monitorul de Petrol si gaze, 8-9/2011, ISSN 1583-0322, 51 – 53pp, 2011.

Mărmureanu A., Ionescu C., Cioflan C.O., Advanced real-time acquisition system of the Vrancea early warning system, *Soil Dynamics and Earthquake Engineering* 31, 163-169, doi 10.1016/j.soildyn.2010.10.002, 2011.

Mărmureanu G., Cioflan C.O., Mărmureanu A., Intensity seismic hazard map of Romania by probabilistic and (neo)deterministic approaches, linear and nonlinear analyses, *Romanian Reports in Physics*, 63, 226–239, 2011.

Moldovan I. A., Moldovan A. S., Ionescu C., IOANE – Infrasound monitoring network: first data, first results, *Rom. Journ. Phys.* 56, 279-288, 2011.

Neagoe C., Manea L.M., Ionescu C., Romanian complex Data Center for dense seismic network, *Annals of Geophysics*, 54, 9-16, 2011.

Pântea A., Constantin A. P., Reevaluated macroseismic map of Vrancea (Romania) earthquake occurred on November 10, 1940, *Rom. Journ. Phys.*, 56, 578-589, Bucharest, 2011.

Popescu E., Neagoe C., Rogozea M., Moldovan I. A., Borleanu F., Radulian M., Source parameters for the earthquake sequence occurred in the Ramnicu Sarat area (Romania) in November-December 2007, *Rom. Journ. Phys.* 56, 265-278, 2011.

Popescu E., Borleanu F., Radulian M., Vrancea earthquake of 25th April 2009: source parameters and directivity, *Rev. Roum. Geophys.* 55, 17-33, 2011.

Rădulescu F., D. Mateciuc D., Considerations regarding Earth crust structure (in Romanian), Monitorul de Petrol si Gaze, 2/2011, ISSN 1583-0322, 39 – 43pp, 2011.

Tumanian, M., 2011, Geothermal interpretation of recent tomography images obtained for the southern part of the Harghita Mountains, Romanian Geophysical Journal, 55,61-69.

2012

Apostol B. F., Scattering of the electromagnetic waves from a rough surface, *Journal of Modern Optics*, Vol. 59, 1607–1616, 2012.

Ardeleanu L., Grecu B., Răileanu V., Peak ground acceleration, velocity and displacement from moderate magnitude undercrustal earthquakes of Vrancea region, *Romanian Report Phys*., vol. 64, 555-570, 2012.

Biagi P. F., Righetti F., Maggipinto T., Schiavulli L., Ligonzo T., Ermini A., Moldovan I. A., Moldovan A. S., Silva H.G., Bezzeghoud M., Contadakis M.E., Arabelos D. N., Xenos T.D., Buyuksarac A., Anomalies observed in VLF and LF radio signals on the occasion of the western Turkey earthquake (Mw=5.7) at May 19, 2011, Special Issue on "Advances in Seismic Geophysics", International Journal of Geosciences (IJG), 3, 856-865 doi:10.4236/ijg.2012.324086, 2012.

Demetrescu, C., Tumanian, M., Dobrica, V., Mares, C., Mares, I., 2012, Pre-observational evolution of surface temperature in Romania as inferred from borehole temperature measurements, *Pure and Applied Geophysics, 169,219-234, doi: 10.1051/s00024-011-0322-2*.

Craiu M., Craiu A., Ionescu C., Popa M., Radulian M., New local magnitude calibration for Vrancea (Romania) intermediate-depth earthquakes, *Romanian Reports in Physics*, 64, 1097-1108, 2012.

D'Alessandro A., Dăneţ A., Grecu B., Location performance and detection magnitude threshold of the Romanian National Seismic Network, *Pure and Applied Geophysics*, 169, 2149-2164, 2012.

Grecu B., Neagoe C., Tătaru D., Seismic noise characteristics at the Romanian broadband seismic network, *Journal of Earthquake Engineering*, vol. 16, 644-661, 2012.

Ismail-Zadeh A., Maţenco L., Radulian M., Cloetingh S., Panza G. F., Geodynamics and intermediate-depth seismicity in Vrancea (The South-Eastern Carpathians): Current state-of-the art, *Tectonophyiscs*, 530–531, 50–79, 2012.

Ivan M., Wang R., Anomalous high amplitude ratios of P5KP/PKPab and P4KP/P(S)cP observed globally around 1 Hz, *J. of Seismology*, DOI 10.1007/s10950-012-9330-7, 2012.

Lang D., Sergio Molina-Palacios S., Lindholm C., Bălan S. F., Deterministic earthquake damage and loss assessment for the city of Bucharest, Romania, *J. Seismol.*, 16, 67–88, DOI 10.1007/s10950-011-9250-y, 2012.

Maliţa Z., Rădulescu F., Mateciuc D., Maramures area Earthquakes (in Romanian), Monitorul de Petrol si Gaze, 1/2012, ISSN 1583-0322, 56 – 59, 2012.

Maliţa Z., Mateciuc D., Estimating the energy accumulation rate inside the crust in Vrancea area, Monitorul de Petrol si Gaze, 2/2012, ISSN 1583-0322, 49 – 58, 2012.

Maliţa Z., Rădulescu F., Mateciuc D., Campia Romana area Earthqaukes (in Romanian), Monitorul de Petrol si Gaze, 5/2012, ISSN 1583-0322, 48 – 53, 2012.

Maliţa Z., Rădulescu F., Mateciuc D., Bucharest area (in Romanian), Monitorul de Petrol si

Gaze, 10/2012, ISSN 1583-0322, 45 – 50, 2012.
Moldovan I.A., Moldovan A., Biagi P. F., Plăcintă A. O., Maggipinto T., The INFREP European VLF/LF radio monitoring network – present status and preliminary results of the Romanian monitoring system, *Romanian Report Phys.*, vol. 64, 263-274, 2012.
Moldovan I.A., Plăcintă A. O., Constantin A.P., Moldovan A.S., Ionescu C., The correlation of geomagnetic anomalies recorded at Muntele Rosu seismic observatory (Romania) with earthquakes' occurrences and solar magnetic storms, *Annals of Geophysics*, 55, 125-137, 2012.
Moldovan I.A., Constantin A.P, Popescu E., Plăcintă A. O., Earthquake risk classes for dams situated in the South-Western part of Romania (Danube, Olt, Jiu and Lotru rivers), *Romanian Report Phys.*, vol. 64, No. 2, 591-608, 2012.
Molinari, I., Răileanu, V. Morelli, A., A crustal model for the Eastern Alps region and a new Moho map in South-Eastern Europe, *Pure and Applied Geophysics*, (PAAG-567R2), DOI 10.1007/s00024-011-0431-y, 2012.
Muco B., Alexiev G., Aliaj S., Elezi Z., Grecu B., Mandrescu N., Milutinovic Z., Radulian M., Ranguelov B., Shkupi D., Geohazards assessment and mapping of some Balkan countries, *Nat Hazards*, DOI 10.1007/s11069-012-0185-6, 2012.
Oros E., Seismicity, seismotectonics and seismic hazard in Timisoara area, *AGIR Bulletin*, nr.3, 16-19, 2012.
Panaiotu C. G., Vişan M., Tugui A., Seghedi I., Panaiotu A.G., Palaeomagnetism of the South Harghita volcanic rocks of the East Carpathians: implications for tectonic rotations and paleosecular variation in the past 5Ma, *Geophys. J. Int.* 189, 369–382, 2012.
Popa M., Radulian M., Szakács A., Seghedi I., Zaharia B., New seismic and tomography data in the southern part of the Harghita Mountains (Romania, south-eastern Carpathians): connection with recent volcanic activity, *Pure and Applied Geophysics*, 169, 1557-1573, 2012.
Popescu E., Borleanu F., Rogozea M., Radulian M., Source analysis for earthquake sequence occurred in Vrancea (Romania) region on 6 to 30 September 2008, *Romanian Report Phys.*, 64, 571-590, 2012.
Rădulescu F., Maliţa Z., 125 years of seismological researches in Romania (in Romanian), Monitorul de Petrol si Gaze, 6/2012, ISSN 1583-0322, 51 – 55, 2012.
Rădulescu F., Maliţa Z., General assignations omn earthquakes from Romania (in Romanian), Monitorul de Petrol si Gaze, 11/2012, ISSN 1583-0322, 45 – 49, 2012.
Răileanu, V., Tătaru D. Grecu B., Crustal models in Romania – I. Moesian platform, *Romanian Report Phys.*, vol. 64, 539-554, 2012.
Răileanu V., Tătaru D., Grecu B., Bălă A., Crustal models in România – II. Moldavian Platform and adjacent areas, *Rom. Journ. Phys.*, Vol. 57, 1438–1454, 2012.
Ren Y., Stuart G.W., Houseman G.A., Dando B., Ionescu C., Hegedüs E., Radovanović S., Shen Y., South Carpathian Project Working Group, Upper mantle structures beneath the Carpathian–Pannonian region: Implications for the geodynamics of continental collision, *Earth and Planetary Science Letters* 349–350, 139–152, 2012.
Righetti F., Biagi P. F., Maggipinto T., Schiavulli L., Ligonzo T., Ermini A., Moldovan I. A., Moldovan A. S., Buyuksarac A., Silva H.G., Bezzeghoud M., Contadakis M. E., Arabelos D.N., Xenos T.D., Wavelet analysis of the LF radio signals collected by the European VLF/LF network from July 2009 until April 2011, *Annals of Geophysics*, 55, 171-180, 2012.
Toma-Danila D., A seismic risk analysis for Focsani and Bacau counties, using SELENA in

near real-time and GIS tools, *Environmental Engineering and Management Journal*, Vol. 11, No. 12, 2265-2274, 2012.

Toma-Danila D., Transport network vulnerability assessment methodology, based on the cost-distance method and GIS integration, *Inteligent Systems for Crisis Management*, Springer Berlin Heidelberg, 199-213, 2012.

Zoran M., Savastru R., Savastru D., Chitaru C., Baschir L., Tautan M., Monitoring of radon anomalies in South-Eastern part of Romania for earthquake surveillance, *Journal of Radioanalytical and Nuclear Chemistry*, DOI: 10.1007/s10967-012-1780-4O, 2012.

Tumanian, M., Frezzotti, M. L., Peccerillo, A., Brandmayr, E., Panza, G. F., 2012, Thermal structure of the shallow upper mantle beneath Italy and neighbouring areas: Correlation with magmatic activity and geodynamic significance, *Earth-Science Reviews*, Volume 114, Issues 3–4, Pages 369–385, http://dx.doi.org/10.1016/j.earscirev.2012.07.002.

2013

Alcik H., Mărmureanu A., Toader V., Ionescu C, Zulfikar C., A study on determination of CAV threshold levels for the Vrancea earthquakes, *Environmental Engineering and Management Journal*, 18, September 2013.

Apostol, A., Moldovan, I.A., Moldovan, A., Ionescu, C., Plăcintă, A.O., The bio-location method used to map crustal faults in Vrancea (Romania) seismic zone, *Romanian Report Phys*., 65 (1), 271-284, 2013.

Apostol B. F., Surface waves in an isotropic semi-infinite body, *Rom. Reps. Phys.*, 65, 4, 1204-1213, 2013.

Bălă A., Arion C., Aldea A., *In situ* borehole measurements and laboratory measurements as primary tools for the assessment of the seismic site effects, *Romanian Report Phys*., 65 (1), 285-298, 2013.

Bălă A., Modelling site amplification based on in situ geophysical measurements in Bucharest, Romania, *Romanian Report Phys*., 65 (2), 495-511, 2013.

Constantin A. P., Pântea A., Macroseismic field of the October 27, 2004 Vrancea (Romania) moderate subcrustal earthquake, *J. of Seismology*, 17, 1149-1156, 2013.

Grecu B., Dragoș Toma-Dănilă, "About earthquakes and their effects " - pre-school education level (in Romanian), CD Press, ISBN 978-606-528-152-3, 2013.

Ivan M., Wang R. J., Anomalous high amplitude ratios of P5KP/PKPab and P4KP/P(S)cP observed
globally around 1 Hz, *J. of Seismology*, 17, 453-464, 2013.

Kronrod T., Radulian M., Panza G. F., Popa M., Paskaleva I., Radovanovich S., Grjibovski K., Sandu I., Pekevski L., Integrated transnational macroseismic data set for the strongest earthquakes of Vrancea (Romania), *Tectonophysics*, 590, 1-23, 2013.

Mateciuc D., Uniaxial deformation analysis in extended Vrancea geodetic network for improving local seismic network (in Romanian), Monitorul de Petrol si Gaze, 12/2013, ISSN 1583 – 0322, 12, 54 – 59pp, 2013.

Mateciuc D., Vertical displacement field computation in Vrancea geodetic network (in Romanian), Monitorul de Petrol si Gaze, 10/2013, ISSN 1583 – 0322, 10, 54 – 59pp, 2013.

Mărmureanu G., Mărmureanu A., Cioflan C. O., Nonlinear seismology a reality. The quantitative data, *Romanian Report Phys*., 65 (2), 512-523, 2013.

Mărmureanu G., Mărmureanu A., Cioflan C. O., Ionescu C., Esential tools to mitigate

Vrancea strong earthquakes effects on Moldavian urban environment, *Environmental Engineering and Management Journal*, Vol. 12, No.1, 65-79, 2013.
Mărmureanu Gh., Cioflan C.O., Mărmureanu A., Ionescu C., Nonlinear seismology a reality. The implications in engineering, SE-EEE Conference Proceedings, 10pag, 2013.
Moldovan, I.A., Modeling the seismogenic process of earthquake occurrence in the Black Sea region using statistical methods, in Special volume in honor of Professor Emeritus M. E. Contadakis, Faculty of Rural and Surveying Engineering - Department of Geodesy and Surveying, Aristotle University of Thessaloniki, pp. 247-258, 2013.
Moldovan, I.A., Apostol, A., Moldovan, A., Ionescu, C., Plăcintă, A.O., The bio-location method used for stress forecasting in Vrancea (Romania) seismic zone, *Romanian Report Phys*., 65 (1), 261-270, 2013.
Oros E., Analysis of two earthquake sequences occurred in 2012 in the Timişoara area, Romania, *Rom. Journ. Phys.*, 58 (7-8), 970–986, 2013.
Panaiotu C. G., Jicha C. G., Singer B. S., Tugui A., Seghedi I., Panaiotu A.G., Necula C., ^{40}Ar/^{39}Ar chronology and paleomagnetism of lavas from Persani Mountains (East Carpathians), *Phys. Earth and Planetary Interiors*, 221, 1-14, 2013.
Pântea A., Constantin A.P., Reevaluation of the macroseismic effects of March 4, 1977 Vrancea (Romania) strong earthquake, *Annals of Geophysics*, 56, 2013.
Ren Y; Stuart G; Houseman G; Grecu B; Hegedüs E; Dando B; Lorinczi P; Gogus O; Kovács A; Török I; László I; Csabafi R; Ionescu C; Radulian M; Raileanu V; Tataru D; Zaharia B; Borleanu F; Neagoe C; Gainariu G; Rau D; Radovanovic S; Kovacevic V; Valcic D; Petrovic-Cacic S; Krunic G; Brisbourne A; Hawthorn D; Lane V, Crustal structure of the carpathian-pannonian region from ambient noise tomography, *Geophysical Journal International*, 195, 1351-1369, 2013.
Rogozea M., Radulian M.,Mărmureanu G., Mândrescu N., Paulescu D., Large and moderate historical earthquakes of 15th and 16th centuries in Romania reconsidered, *Romanian Report Phys*., 65 (2), 545-562, 2013.
Stanciu A.C., Russo R. M., Mocanu V. I., Munteanu L., Shear-wave splitting within the Southeastern Carpathian Arc, Transylvanian Basin, Romania, *J. of Geodynmics*, 70, 61-69, 2013.
Stucchi M., Rovida A., Gomez Capera A.A., Alexandre P., Camelbeeck T., Demircioglu M.B., Kouskouna V., Gasperini P., Musson R.M.W., Radulian M., Sesetyan K., Vilanova S., Baumont D., Faeh D., Lenhardt W., Martinez Solares J.M., Scotti O., Zivcic M., Albini P., Batllo J., Papaioannou C., Tatevossian R., Locati M., Meletti C., Viganò D. Giardini D., The SHARE European Earthquake Catalogue (SHEEC) 1000-1899, *J. of Seismology*, 17, 523-544, 2013.
Toma-Danila D., Transport network vulnerability assessment methodology, based on the cost-distance method and GIS integration, Inteligent Systems for Crisis Management; Springer Berlin Heidelberg, pp 199-213, 2013.
Văcăreanu R., Lungu D., Mărmureanu G., Cioflan C.O., Aldea A., Arion C., Neagu C., Demetriu S., Pavel F., Statistics of seismicity for Vrancea subcrustal source", *Proceedings of the International Conference on Earthquake Engineering SE-50 EEE*, Skopje, Macedonia, paper no. 138, 2013.
Zaharia B., Tătaru D., Grecu B., Ionescu C., Tibu S., Bica-Brisan N., Georgescu E.-S., Romanian educational seismic network: educational tool for increasing awarness of seismic risk, Proceedings of the GeoConference on Ecology, Economics, Education and Legislation, 16-22 June 2013, Albena, Bulgaria, vol. II, 513-520, 2013.

Zaharia B., Tataru D., Borleanu F., Brisan N., Georgescu E. S. „About earthquakes and their effects. Teacher's/student's notebook."for primary, middle-school and high-school education levels (in Romanian), ISBN 978-606-528-157-8, Editura CD PRESS, 2013.

2014

Apostol B. F., The effect of the surface inhomogeneities on the propagation of the elastic waves, *Journal of Elasticity: The Physical and Mathematical Science of Solids*, Vol. 114, No. 1, 85-99, 2014.

Ardeleanu L., Neagoe C., The performance of the stations of the Romanian seismic network in monitoring the intermediate depth seismic activity of Vrancea region, *Proc. 5th Nat. Conf. Earthquake Eng. & 1st Nat. Conf. Earthquake Eng. and Seismol.*, Bucharest, 19-20 June 2014, 2014.

Ardeleanu L., Neagoe C., The performance of the stations of the Romanian seismic network in monitoring the local seismic activity. Part I. Vrancea subcrustal seismicity, *Romanian Reports in Physics*, 2014 (in press).

Armaş I., Radulian M., Spatial multi-criteria risk assessment for earthquake hazards in Bucharest, Romania, in „Earthquake Hazard Impact and Urban Planning" (Eds. M. D. Bostenaru, I. Armas, A. Goretti), Springer Series, XIII, 127-149, 2014.

Bălan S. F., Ioane D., Cioflan C. O., Panea I., Apostol B., Maliţa Z., Chitea F., Anghelache M. A., Scenarios for local seismic effects of Tulcea (Romania) crustal earthquakes - Preliminary approach of the seismic risk characterization for Tulcea city, in „Earthquake Hazard Impact and Urban Planning" (Eds. M. D. Bostenaru, I. Armas, A. Goretti), Springer Series, XIII, 85-103, 2014.

Bălă A., Quantitative modelling of seismic site amplification in an earthquake-endangered capital city: Bucharest, Romania, *Natural Hazards*, 72, 1429–1445, 2014.

Bălă A., Improved methodology towards a quantitative assessment of site effects employing geophysical and seismological data, SGEM 2014, 14-th International Multidisciplinary Scientific GeoConference, Conference Proceedings, Book 1, vol.1, 489-496, 2014.

Bălă A., Hannich D., Ehret D., Huber G., Liquefaction probability in Bucharest and influencing factors, SGEM 2014, 14-th International Multidisciplinary Scientific GeoConference, Conference Proceedings, Book 1, vol.2, 573-580, 2014.

Craiu M., Craiu A, Mărmureanu A., Local magnitude scale ml evaluation for the main crustal seismic zones of Romania, *Romanian Reports in Physics*, Vol. 65, 2014 (in press).

Dobre Daniela, Claudiu-Sorin DRAGOMIR, Emil-Sever GEORGESCU, Constantin IONESCU, Dragos TATARU, Proactive vs. reactive learning on buildings response and earthquake risks, in schools of Romania, Proceedings 15th EUROPEAN CONFERENCE ON EARTHQUAKE ENGINEERING EAEE& 34th GENERAL ASSEMBLY OF THE EUROPEAN SEISMOLOGICAL COMMISSION, 24-29 august 2014, Istanbul, 8 pag.

Grecu Bogdan, Dragos TATARU, Bogdan ZAHARIA, Constantin IONESCU, Speranta TIBU, Emil-Sever GEORGESCU, Nicoleta BICAN-BRISAN, Raising Earthquake Awareness in Romania Through an Educational Project (ROEDUSEIS), Proceedings 15th EUROPEAN CONFERENCE ON EARTHQUAKE ENGINEERING EAEE& 34th GENERAL ASSEMBLY OF THE EUROPEAN SEISMOLOGICAL COMMISSION, 24-29 august 2014, Istanbul.

Ioane D., Diaconescu M., Chitea F., Active fault systems and their significance for urban planning in Bucharest, Romania, in "Earthquake Hazard Impact and Urban Planning" (Eds. M. D. Bostenaru, I. Armas, A. Goretti), Springer Series, XIII, 15-43, 2014.

Mărmureanu Gh., Cioflan C.O., Mărmureanu A., Manea E. F., Nonlinear seismology a reality. Bridging the gap between this reality and earthquake engineering, in „Proceedings of the 5th National Conference on Earthquake Engineering and 1st National Conference on Earthquake Engineering and Seismology" (Ed. Vacareanu R, Ionescu C), Editura ConsPress, Bucuresti 2014, ISBN 978-973-100-342-9.

Moldovan I. A., Constantin A. P., Popescu E., Plăcintă A. O., Toma-Dănilă D., Seismic hazard and risk studies for large Romanian dams situated in the western part of Romania, Editura ConsPress, Bucuresti 2014, pp 197-204, ISBN 978-973-100-342-9.

Oros E., Diaconescu M., Recent vs Historical seismicity analysis for Banat Seismic Region (western part of Romania), in „Proceedings of the 5th National Conference on Earthquake Engineering and 1st National Conference on Earthquake Engineering and Seismology" (Ed. Vacareanu R, Ionescu C), Vol. 1 „Seismology and engineering seismology", pp. 181-189. Editura CONSPRESS, Cod CNCSIS 252, ISBN 978-973-100-342-9, 2014.

Partheniu R., Diaconescu M., Grecu B., Ionescu C., Neagoe C., Mărmureanu A., Verdeş I., Earthquakes and tsunamis monitoring inth western Black Sea area, Proceedings of 5th National Conference on Earthquake Engineering & 1st National Congerence on Earthquake Engineering and Seismology, editori R. Vacareanu si C. Ionescu, editura CONSPRESS, pag 157-164.

Pavel F., Văcăreanu R., Cioflan C., Iancovici M., Spectral characteristics of strong ground motions from intermediate-depth Vrancea seismic source, *Bulletin of the Seismological Society of America*, 104, 2842–2850, 2014.

Pavel F.,Văcareanu R., Ionescu C., Iancovici M., Sercaianu M., Investigation of the variability of strong motions from Vrancea earthquakes, *Natural Hazards*,Vol.74 (3), 1707-1728, Doi:10.1007/s11069-014-1273-6.

Radulian M., Preface, in „Earthquake Hazard Impact and Urban Planning" (Eds. M. D. Bostenaru, I. Armas, A. Goretti), Springer Series, 2014, XIII, p. 313.

Radulian M., Mechanisms of Earthquakes in Vrancea, in *Encyclopedia of Earthquake Engineering* (eds. Michael Beer, Edoardo Patelli, Ioannis Kougioumtzoglou and Ivan Siu-Kui Au), Springer-Verlag, Berlin Heidelberg, DOI 10.1007/978-3-642-36197-5_302_1, 2014.

Radulian M., Popescu E., Borleanu F., Diaconescu M., Source parameters of the December 2011 - January 2012 earthquake sequence in Southern Carpathians, Romania, *Tectonophysics*, 623, 23-38, 2014.

Rogozea M., Mărmureanu G., Radulian M., Toma D., Reevaluation of the macroseismic effects of the January 23, 1838 Vrancea earthquake, *Romanian Reports in Physics*, 66(2), 520-538, 2014.

Solakov D., Simeonova S., Ardeleanu L., Alexandrova I., Trifonova P., Cioflan C., Hazard assessment for Romania - Bulgaria cross-border region, Proceeding of the Bulgarian Academy of Sciences / Comptes rendus de l'Académie bulgare des Sciences, 67 (6), 835-842, 2014.

Toader, V.E., Moldovan I.A., Ionescu C., Complex monitoring and alert system for seismotectonic phenomena, *Romanian Journal of Physics*, 2014 (in press).

Văcăreanu R., Mărmureanu G., Pavel F., Neagu C., Cioflan C. O., Aldea A., Analysis of soil factor S using strong ground motions from Vrancea subcrustal seismic source, *Romanian Reports in Physics*, 66(3), 893-906, 2014.

Văcăreanu R., Lungu D., Radulian M., Pavel F., Iancovici M., Arion C., New developments in probabilistic seismic hazard analysis for Romania, Proceedings 15th European Conference on Earthquake Engineering and 34th General Assembly of the European Seismological Commission, 24-29 August 2014, Istanbul, 4 pag.

I A V C E I ACTIVITIES IN ROMANIA

2011 - 2014

International Association of Volcanology and Chemistry of the Earth's Interior

IAVCEI ACTIVITIES IN ROMANIA 2011 - 2014

Romanian IAVCEI Committee

National Correspondent, President of the Committee:

Alexandru Szakács
Sapientia University, Dept. of Environmental Sciences
4, Matei Corvin St.
400112 Cluj-Napoca, Romania
Phone/Fax: +40-741-534405
E-mail: szakacs@sapientia.ro

and

Institute of Geodynamics "Sabba S. Ştefănescu", Romanian Academy
19-21, Jean-Louis Calderon St.
70201 Bucharest, Romania
Phone: +4021- 2113086
Fax: +4021-2100604
E-mail: szakacs@k.ro

Secretary: **Eugenia Niţoi**
Geological Institute of Romania
1, Caransebeş Street
78344, Bucuresti 32, Romania
Phone: +40-21-224 1530/216
Fax: +40-21-224 0404
E-mail: jeniniţoi@yahoo.com

Member: **Marinel Kovacs**
Technical University of Cluj-Napoca
North University Centre of Baia Mare
62/A, Victor Babeş St,
430083, Baia Mare, Romania
Phone: +40-262-422 196
Fax: +40-262-276 812
E-mail: marinelkovacs@yahoo.com

- Geological Society of Romania
- Mineralogical Society of Romania
- Romanian Society of Geophysics

University education:

- University of Bucharest, Faculty of Geology and Geophysics, Bucharest
- Babeş-Bolyai University, Faculty of Biology and Geology, Cluj-Napoca
- Sapientia University, Faculty of Natural Science and Arts, Dept. of Environmental Sciences, Cluj-Napoca
- Alexandru Ioan Cuza University, Faculty of Geography and Geology, Iaşi
- Technical University of Cluj-Napoca, North University Centre of Baia Mare, Faculty of Engineering, Dept. of Mineral Resources, Materials and Environmental Engineering.

Scientific symposia:

- National Symposium of Geophysics

Publications:

- Revue Roumaine de Géologie
- Revue Roumaine de Géophysique
- Studia Universitatis Babeş-Bolyai, Cluj-Napoca
- Analele Universităţii „Al. I. Cuza" Iaşi, Geologie
- Romanian Journal of Earth Sciences
- Anuarul Institutului Geologic al României

PART I: INTRODUCTION AND ORGANIZATION

by Alexandru Szakács

National Correspondent, President of the Committee

(szakacs@sapientia.ro)

During the inter-IUGG General Assembly time period 2011-2014, the small volcanological community in Romania continued to cope with problems related to the economic and social transition of the country in the post-communist era. Romania Joined the European Union at January 1st, 2007, a new status which was hoped to significantly improve the availability of both National and EU funds for scientific research, volcanology included. Those hopes have not been fulfilled, at least in the domain of IAVCEI-interest research. Both financial and institutional problems strongly influenced IAVCEI-related activities in this period. Since most of the Romanian IAVCEI members were employees of the Geological Institute of Romania, the financial crisis this institution still copes with, had negatively influenced geological investigation in Romania including the domains of IAVCEI interest. Many researchers actively involved in volcanological and petrological/geochemical investigation had to find alternative jobs and part of them gave up with their former research work. The strong research nucleus active in these fields within the Geological Institute of Romania in the 90's dispersed early in the 2000's and remained so, and no other group aggregated later elsewhere.

In the same time, research effort in volcanology shifted towards Universities, such as Babeş-Bolyai University and Sapientia University in Cluj-Napoca and North University in Baia Mare. The "Alexandru Ioan Cuza" University in Iaşi is specialized in geochemistry, especially related to CEI topics. However, only few researchers are actively involved in volcanological investigation at each university center, mostly on individual basis, more ore less isolated from each other. They benefit from poor or no institutional support doing so. At this time there is no any strong and internationally recognized research group specialized in IAVCEI topics in Romania. Most of the scientific results reported here were obtained through unsupported and uncoordinated individual efforts of certain individual researchers or of ad-hoc aggregated groups of a few researchers. The trend of declining Romanian IAVCEI membership signaled in our previous report, continued during the time period considered here. Low wages (under US$ 7500/year in general) and job instability precluded effectiveness of new membership recruitment, while a number of former IAVCEI members gave up their membership for similar reasons. The Romanian IAVCEI membership – a former "success story" (see Romanian IUGG Report, 1999) - continued shrinking, and this trend could not be reversed so far.

In such circumstances, the Romanian National IAVCEI Section considers further membership recruitment as one of its major current tasks. Membership "erosion" from the Group is caused by objective and subjective factors, such as frustration related to unrealistic expectations upon subscription, poor fit of changing professional duties and interests with IAVCEI activities and research topics, job instability. Despite this, a few scientists with constant interest and dedication in IAVCEI-related science, still forms the small stable and active core of the Romanian National IAVCEI Section. They are active in research and publication and are willing to take part in IAVCEI-organized activities and events.

Despite the difficulties, scientific progress in IAVCEI-related research domains has been attempted to be kept at a steady-state pace. Individual efforts have also been made to maintain and develop connection of researchers with the international community by publication, attendance of scientific meetings and assemblies, and participations in international cooperation projects.

Members of the Romanian National IAVCEI Section Committee have tried to actively interact with IAVCEI officials and leaders of IAVCEI Commissions (especially CEV and CVS) by electronic correspondence and personal contacts during international meetings whenever attendance was possible.

Research centers in Romania where IAVCEI-related topics are being investigated

Active research in IAVCEI-related scientific domains, such as paleovolcanology, petrology of volcanic rocks, igneous rocks-related mineralogy, granite studies, metamorphic petrology, geochemistry, ore geology in volcanic areas and geophysics of volcanic areas, is conducted mostly by individuals and small groups of professionals at a number of institutions in Romania, from which the IAVCEI membership is recruited:

- Institute of Geodynamics „Sabba S. Ştefãnescu", Romanian Academy;
- The Geological Institute of Romania (Department of Mineralogy and Petrology; Department of Geophysics);
- Sapientia University, Cluj-Napoca (Department of Environmental Sciences);
- „Babeş-Bolyai" University, Cluj-Napoca (Department of Geology);
- Technical University of Cluj-Napoca, North University Centre of Baia Mare, Faculty of Engineering, Dept. of Mineral Resources, Materials and Environmental Engineering.
- University of Bucharest (Department of Mineralogy and Petrology, Department of Geophysics);
- „Alexandru Ioan Cuza" University (Department of Geology), Iaşi;
- S.C. Prospecţiuni S.A., Bucharest.

Membership: 17 Romanian IAVCEI members as currently (February 2nd, 2015) listed in the IAVCEI membership Directory:

Ioan Bedelean	Babeş-Bolyai University, Cluj-Napoca
Dorin Dordea	"Prospectiuni S.A." Company, Bucharest
Alexandrina Fülöp	North University of Baia Mare/De Beers Canada, Toronto
Nicolae Har	Babeş-Bolyai University, Cluj-Napoca
Viorica Iancu	Geological Institute of Romania, Bucharest
Corina Ionescu	Babeş-Bolyai University, Cluj-Napoca

Marinel Kovacs	Technical University of Cluj-Napoca, North University Centre of Baia Mare
Attila Laszlo	†
Viorel Mirea	Institute of Geodynamics „Sabba S. Ştefãnescu", Romanian Academy, Bucharest
Marian Munteanu	Geological Institute of Romania, Bucharest
Eugenia Nitoi	Geological Institute of Romania, Bucharest
Razvan Gabriel Popa	Institute of Geodynamics „Sabba S. Ştefãnescu", Romanian Academy, Bucharest
Robert Constantinescu	Babeş-Bolyai University, Cluj-Napoca
Ioan Seghedi	Institute of Geodynamics „Sabba S. Ştefãnescu", Romanian Academy, Bucharest
Ildiko Soós	Babeş-Bolyai University, Cluj-Napoca
Alexandru Szakács	National Correspondent,
	Sapientia University, Cluj-Napoca, and Institute of Geodynamics „Sabba S. Ştefãnescu", Romanian Academy, Bucharest
Ionel Ureche	"Lafarge" Company, Cluj-Napoca

PROFESSIONAL EVENTS

Participation to IAVCEI events and to events including IAVCEI-interest topics

2011 IUGG General Assembly. Earth on the Edge: Science for a Sustainable Planet. 28 June - 7 July 2011, Melbourne, Australia. IAVCEI Symposia. Contributions presented:

1."Neogene intermediate arc type-related monogenetic volcanism in Oaş-Gutâi Mts., NW Romania" – M. Kovacs and A. Fülöp

2. „Miocene arc-type volcanic system and related vein-type epithermal mineralisations from Gutâi Volcanic Zone (Eastern Carpathians, Romania)" - M. Kovacs and A. Fülöp

2013 Basalt2013 International Conference, Görlitz, Germany, April 24-28, 2013. Contributions presented:

1. "Volcano instability: causes, processes and consequences" – A. Szakács, invited lecture

2. „Locating phreatomagmatic eruptive centers by "inverse ballistics": A new methodological approach applied in the Persani Mts., Romania" - A. Szakács and I. Soós

3. *„Firiza basalts - the final stage of the Neogene calc-alkaline volcanic activity from Gutâi Volcanic Zone, Eastern Carpathians, Romania"*

- Kovacs M., Pécskay Z., Fülöp A., Jurje M., Edelstein O

2013 IAVCEI Scientific Assembly, 24- 29 July 2013, Kagoshima, Japan. Contributions presented:

1. *„Small calc-alkaline volcanoes from the Oaş-Gutâi Neogene volcanic area, Eastern Carpathians, Romania; contribution to the controversial monogenetic versus polygenetic classification"*- Kovacs M., Fülöp A., Pécskay Z.

2. „*Magma-mixing and -mingling as key magmatic processes controlling the development of the volcanic events in the Gutâi Neogene Volcanic Zone, Eastern Carpathians, Romania"* - Kovacs **M.,** Fülöp A., Pécskay Z., Jurje M.

3. *RAZVAN POPA-lucrare*

2014 XX Congress of the Carpathian Balkan Geological Association, Tirana, Albania, 24-26 September 2014. Contributions presented:

1. *"Time-space evolution and volcanological features of the Late Miocene-Quaternary Călimani-Gurghiu-Harghita volcanic range, East Carpathians, Romania. A review"*- A. Szakács, I. Seghedi, Z. Pécskay

2. „*Dome-building volcanic activity in the Oaş-Gutâi Neogene volcanic area, Eastern Carpathians, Romania"*- Kovacs **M.,** Fülöp A., Pécskay Z.

3. Lucrarea Seghedi geofizica Persani

2014 IAVCEI 1st International Workshop on Volcano Geology, July 7-11, Madeira, Portugal. Contributions presented:

1. *„Long-term evolution of composite volcanoes: A new perspective"* – A. Szakács

2. *„Geomorphic consequences of volcano spreading. Examples from the East Carpathians, Romania"* – A. Szakács, I. Rus, O. Pop

PART II: PROGRESS REPORT OF SCIENTIFIC RESEARCH IN RELEVANT IAVCEI-INTEREST DOMAINS IN ROMANIA

Romanian researchers, whether IAVCEI members or not, achieved some significant progress of knowledge in a number of research domains which are within the area of IAVCEI interests. The following part of this report consists of a list of papers and abstracts published in the time interval 2011-2014 from which a general picture of the main results obtained may emerge.

PhD Theses

2012

Maria Jurje (2012) Quartz andesites from Oaş-Gutâi Neogene volcanic zone (Romania). Babeş-Bolyai University, Dept. of Mineralogy, Cluj-Napoca

Botond Papp (2012) Radon and radon fluxes in soil. Environmental, geological and geophysical applications. PhD Thesis, Babeş-Bolyai University, Dept. of Environmental Sciences, Cluj-Napoca

Olimiu Traian Pop (2012) Étude comparative des processus géomorphologiques contemporains dans les massifs volcaniques du Sancy et du Călimani. PhD Thesis, Babeş-Bolyai University, Dept. of Geography, Cluj-Napoca

Robert Constantinescu (2012) Methods for quantitative volcanic hazard assessment in densely populated area, with emphasis on pyroclastic flows. Case study: El Misti and Arequipa, South-western Peru. PhD Thesis, Babeş-Bolyai University, Dept. of Geography, Cluj-Napoca

2013

Nicolae Frunzeti (2013) Geogene gas emissions in the southern sector of the East Carpathians (in Romanian). PhD Thesis, Babeş-Bolyai University, Dept. of Environmental Sciences, Cluj-Napoca

Boglárka Mercedesz Kis (2013) Hydrogeochemistry of mineral waters from the Eastern Carpathians-Transylvanian Basin boundary. PhD Thesis, Babeş-Bolyai University, Dept. of Environmental Sciences, Cluj-Napoca

2014

Boglárka Czellecz (2014): Mineral water resources on the western side of the Harghita Mountains (southern sector) and their valorization (in Romanian). PhD Thesis, Babeş-Bolyai University, Dept. of Geography, Cluj-Napoca

Ágnes Gál (2014) Epithermal processes related to Neogene andesite intrusions in the Certej area (Apuseni Mountains, Romania). PhD Thesis, Babeş-Bolyai University, Dept. of Geology, Cluj-Napoca

Book chapters

A.-V. Bojar, J. Dodd, I. Seghedi. Isotope geochemistry (O, H and Sr) of Late Cretaceous volcanic rocks, Hateg Basin, South Carpathians, Romania. In Bojar, A.-V., Melinte-Dobrinescu, M. C. & Smit, J. (eds) Isotopic Studies in Cretaceous Research. Geological Society, London, Special Publications, 382, http://dx.doi.org/10.1144/SP382.10

Research papers

2011

Apopei A.I., Buzgar N., Buzatu A. (2011) Raman and infrared spectroscopy of kaersutite and certain common amphiboles. **Analele Științifice ale Universității "Alexandru Ioan Cuza" din Iaşi, seria Geologie**, 57 (2), 35-58 (ISSN 1223-5342)

Seghedi, I., Maţenco L., Downes, H., Mason, P.R.D., Szakács, A., Pécskay, Z., (2011) Tectonic significance of changes in post-subduction Pliocene–Quaternary magmatism in the south east part of the Carpathian–Pannonian Region. **Tectonophysics** 502, 146-157, doi:10.1016/j.tecto.2009.12.003

Seghedi I. (2011) Permian subaqueous rhyolitic domes changing to surtseyan tuff deposits and subaerial domes: Sirinia Basin (SW Romania-Eastern Europe). **J. Volcanol. Geotherm. Res.** 201, 312-324 (2010), doi:10.1016/j.jvolgeores.2010.07.015

Seghedi, I., Downes, H., 2011. Geochemistry and tectonic development of Cenozoic magmatism in the Carpathian-Pannonian region. **Gondwana Research** 20, 655-672.

Szakács A. (2011) Earthquake prediction using extinct monogenetic volcanoes: A possible new research strategy. **Journal of Volcanology and Geothermal Research**, 201, 404-411

2012

Dill, H. G., Iancu, O.G., Ionesi, V., Sârbu, S., Balintoni, I., Botz, R. (2012) Petrography and chemistry of Bessarabian siliciclastic rocks in the East Carpathian Foreland Basin (Romania and Moldova) – with special reference to heavy mineral-based provenance and environment analyses, **Neues Jahrbuch für Geologie und Paläontologie** – Abhandlungen, 263/3, pp. 199-226.

Moldoveanu S. (2012) Geochemical characteristics of Rare Earth Elements and selected trace elements from the Manaila ore deposit (Eastern Carpathians). **Carpathian Journal of Earth and Environmental Sciences,** 7 (3), 193 – 198.

Popa M., Radulian M., Szakács A., Seghedi I., Zaharia B., 2012. New Seismic and Tomography Data in the Southern Part of the Harghita Mountains (Romania, Southeastern Carpathians): Connection with Recent Volcanic Activity. **Pure and Applied Geophysics** 169, 9, 1557-1573, DOI: 10.1007/s00024-011-0428-6

Panaiotu, C.G., Vişan, M., Ţugui, A., Seghedi I., Panaiotu A. G. 2012. Palaeomagnetism of the South Harghita volcanic rocks of the East Carpathians: implications for tectonic rotations and palaeosecular variation in the past 5Ma. **Geophys. J. Int.** 189, 369–382, doi: 10.1111/j.1365-246X.2012.05394.x.

Szakács A., Pécskay Z., Silye L., Balogh K., Vlad D., Fülöp A. (2012) On the age of the Dej Tuff, Transylvanian Basin, Romania. **Geologica Carpathica**, 63, 138-148, doi: 10.2478/v10096-012-0011-9

Servida D., Comero S., Dal Santo M., de Capitani L., Grieco G., Marescotti P., Porro S., Forray F.L., Gál Á., Szakács A. (2012) Waste rock dump investigation at Rosia Montana gold mine (Romania): a geostatistical approach. **Environ. Earth Sci.,** DOI 10.1007/s12665-012-2100-6

2013

Buzatu A., Buzgar N., Damian G., Vasilache V., Apopei I.A. (2013) The determination of the Fe content in natural sphalerites by means of Raman spectroscopy. **Vibrational Spectroscopy**, 68, 220-224.

Panaiotu, C.G., Jicha, B.R., Singer, B.S., Tugui, A., Seghedi, I., Panaiotu, A.G. Necula, C., 2013. 40Ar/39Ar chronology and paleomagnetism of Quaternary basaltic lavas from the Persani Mountains (East Carpathians). **Physics of the Earth and Planetary Interiors** 221, 1–14.

Szakács, A., Seghedi, I. 2013. The relevance of volcanic hazard in Romania: is there any? **Environmental Engineering and Management Journal** 12, 1, 125-135.

Seghedi I., Ersoy Y. E., Helvacı C., 2013. Miocene–Quaternary volcanism and geodynamic evolution in the Pannonian Basin and the Menderes Massif: A comparative study. **Lithos** 180-181, 25-42.

Kovacs M., Pécskay Z., Fülöp A., Jurje M., Edelstein O. (2013): Geochronology of the Neogene intrusive magmatism of the Oaş-Gutâi Mountains., Eastern Carpathians, (NW Romania). **Geologica Carpathica**, 64/4, 483-496

Harangi Sz., Sági T., Seghedi I., Ntaflos Th., 2013. Origin of basaltic magmas of Perşani volcanic field, Romania: A combined whole rock and mineral scale investigation. **Lithos** 180-181, 43-57.

Prelević D., Seghedi I., 2013. Magmatic response to the post-accretionary orogenesis within Alpine – Himalayan belt - Preface. **Lithos** 180-181, 1-4.

Veres D., Lane C.S., Timar-Gabor A., Hambach U., Constantin D, Szakács A., Fülling A, Onac B.P. (2012, in press) The Campanian Ignimbrite/Y5 tephra layer – A regional stratigraphic marker for Isotope Stage 3 deposits in the Lower Danube region, Romania. **Quaternary International.** http://dx.doi.org/10.1016/j.quaint.2012.02.042.

2014

Apopei A.I., Damian G., Buzgar N., Milovska S., Buzatu A. (2014) New occurences of hessite, petzite and stützite at Coranda-Hondol open pit (Certej gold-silver deposit, Romania). **Carpathian Journal of Earth and Environmental Sciences**, 9 (2), 71-78.

Buzatu A., Damian G., Dill H.G., Buzgar N., Apopei A.I. (2014) Mineralogy and geochemistry of sulfosalts from Baia Sprie ore deposit (Romania) — New bismuth minerals occurrence. **Ore Geology Reviews**, 65 (1), 132-147

Nicolae I., Seghedi I., Bobos I., do Rosário Azevedo M., Ribeiro S., Tatu M., 2014. Permian volcanic rocks from the Apuseni Mountains (Romania): Geochemistry and tectonic constraints. **Chemie der Erde**, 74, 125–137.

Jurje M., Ionescu C., Hoeck V., Kovacs M. 2014. Geochemistry of Neogene quartz andesites from the Oaş and Gutâi Mountains, Eastern Carpathians (Romania):a complex magma genesis. **Mineralogy and Petrology**, 108, 13-32.

Naumov, V. B., Kovalenker, V.A., Damian, Ghe., Abramov, S.S., Tolstykh, M. L., Prokofiev, V. Yu., Damian, F., Seghedi, I., 2014. Origin of the „Laleaua Alba" dacite (Baia Sprie volcanic area and Au-Pb-Zn ore district, Romania): evidence from study of melt inclusions. **Central European Geology**, 57/1, 83–112.

Seghedi, I.Ersoy, Y. E.; Helvaci, C., 2014. Miocene-Quaternary volcanism and geodynamic evolution in the Pannonian Basin and the Menderes Massif: A comparative study (vol 180, pg 25, 2013) corrigendum, **LITHOS** 190, 522-522.

Seghedi I., Pécskay Z., Onescu P. 2014. Petrography, geochemistry and geochronology of selected samples from two banatite intrusions near Gladna Montană, Poiana Ruscă Mountains, Romania by, **Romanian Journal of Mineral Deposits,** 87, 1, 91-95.

Chernyshev I. V., Kovalenker V. A., Chugaev A., Damian G., Damian F., Iatan L. E., Seghedi I., 2014. New High-Precision Lead Isotope Analyses of Galena From Romanian Ore Districts and a Review, **Romanian Journal of Mineral Deposits** 87, 1, 83-87. Papp B.,

Szakács A., Néda T, Frunzetti N., Szacsvai K., Cosma C. (2014) Soil radon and thoron activity concentrations and CO_2 flux measurements in the Neogene volcanic regions of the Eastern Carpathians (Romania). **Carpathian Journal of Earth and Environmental Sciences**, 9,1, 261-268

Book review papers

Szakács A. (2012) Rosaly Lopes—Volcanoes: a Beginner's Guide. Oneworld, 1st edition (January 1, 2011) Oneworld Beginner's Guides. Paperback, 208 pages. ISBN-10: 1851687254, ISBN-13: 978-1851687251. Book review. **Bulletin of Volcanology,** 74:1771–1774, DOI: 10.1007/s00445-011-0539-z, Springer Verlag

Szakács A. (2012) C. Breitkreuz and N. Petford (eds): Physical geology of high-level magmatic systems and K. Thomson and N. Petford (eds): Structure and emplacement of high-level magmatic systems. Geological Society, London 2004, Special Publications 234, Hardcover, 262 pages, ISBN 978-1-86239-169-7 and Geological Society, London 2008, Special Publications 302, Hardcover, 240 pages, ISBN 978-1-86239-256-4. Book review. **Bulletin of Volcanology,** DOI 10.1007/s00445-012-0611-3

Szakács A. (2013) G. Groppelli and L. Viereck-Goette (eds.): Stratigraphy and geology of volcanic areas. The Geological Society of America Special Paper, 2010, 464 pages, ISBN 978-0-8137-2464-5 (pbk). Book review. **Bulletin of Volcanology**, 75, 6, 725, DOI 10.1007/s00445-013-0725-2

Acknowledgements

This Report has been prepared with the logistical support of the Sapientia University, Department of Environmental Science, Cluj-Napoca. The report also benefited from the contribution of Ioan Seghedi, Marinel Kovacs, Nicolae Buzgar, Ovidiu Iancu and Boglárka Mercedesz Kis.