IASPEI
RESEARCH ACTIVITIES IN GREECE
FOR THE PERIOD 2015-2018

Edited by

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-Institute of Engineering Seismology and Earthquake Engineering (ITSAK)

- Seismological Laboratory (UPSL), University of Patras

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NATIONAL OBSERVATION OF ATHENS

GEODYNAMIC INSTITUTE (GI)

RESEARCH ACTIVITY IN THE FIELD OF SEISMOLOGY AND PHYSICS OF THE EARTH

GI's research directions cover a wide range of the fields of Seismology, Physics of the Earth's interior environment, Geophysics, Geodesy, Tectonic Lithospheric Plates, Volcanology, Geothermy, Seismatectonic, Technical Seismology and Tsunami. GI's research activities cover the following fields:

Seismicity:

- Pre-seismic , main and post-seismic sequences
- Seismo-tectonic studies of several entities/territories
- Microsecmatic activity along selected seismic zones
- Seismic potential of active fractures
- Seismic tranquility of Greece and surrounding areas
- Induced seismic activity
- Interaction of active fractures
- Identification of seismic activity characteristics
- Earthquake Generation Mechanisms - Seismic Source Properties
- Spectral characteristics of Pre-seismic, main and post-seismic
- How to break the powerful earthquakes
- Dynamic parameters of breaking

Dissemination of seismic waves :

- Depreciation of strong seismic motion
- Directivity of the propagation of seismic energy
- Synthetic powerful strong seismic movements (stochastic processes)
- Synthetic powerful seismic movements using Green functions
- Seismic hazard - Microzone studies
- Optimization of algorithms for calculating expected seismic accelerations, speeds and shifts
- Optimization of algorithms for calculating statistical parameters
- Optimization of micro-zoning studies

Structure:

- Earth crust structure and mantle
- Seismic wave damping
- Seismic wave velocity distribution
- Seismic tomography and calculation of seismic parameters

Earthquake forecast:

- Seismic tranquility of Greek space and surrounding areas
- Identification of seismic activity characteristics
- Magnetotellular methods - Electromagnetic emission

Parametric survey of geophysical-seismological parameters from related scientific disciplines:

- Identification of typical seismicity forms
- Geophysical methods
- Statistical methods
- Algorithms for combining the different characteristics of seismic activity
- Seismo-tectonic - Paleoseismology
- Correlation of micro seismic activity with active faults
- Historic seismicity and connection with known breaks

Seismic Sea Waves (Tsunami):

Geological Remote Sensing:

- Remote sensing of active fissures/faults
- Remote sensing of landslides
- SAR interferometry

Applied Geophysics:

- Seismic methods of reflection and refraction
- Seismic tomography
- Geoelectric imaging
- Georadar
- Non-destructive testing
- Passive seismic surveys/research
- Seismic cortical surveys/research
- Hydrogeology
- Geothermy

The National Wide Digital Seismic Network

Since 1997, G.I. is operating a broadband digital seismic network under the FDSN code HL. On 2000, the systematic recording and processing of digital seismological data was established, and today there are 49 broadband digital stations operating in real time. In each seismographic station, additional calculating-geophysical equipment is operating, resulting to multiparametric data transmittion to G.I.'s facilities in Athens in real time. In 14 seismological stations VHF antennas are installed for the measurement of the electromagnetic emission at 41 and 46 MHz (collaboration with ATEI of Athens). In 26 seismological stations are also installed accelerometers for the recordings of strong seismic vibration, while in selected seismological stations are installed permanent GPS receivers as well. Furthermore there are seismic stations with meteorological instruments installed and magnetic field measuring instruments in cooperation with the IEPBA and IAADET Institutes of NOA.

Through the use of the Public Administration Network's communications, all data is transmitted to the central facilities in Athens where they are stored and processed. In 2003, the seismic network became compatible with most European seismographic networks, applying the the SeedLink data transfer protocol, so as to obtain the availability to exchange data in real time. In particular, HL network stations are available in IRIS (4), ORFEUS (10), INGV - MEDNET (8) and GFZ-GEOFON (11) networks. At the same time, G.I. receives data from seismological stations located in Italy, Malta, Albania, Bulgaria, Montenegro, Serbia, Bosnia, Turkey and Cyprus. In the specialized website of the seismological network

http://bbnet.gein.noa.gr, detailed network information is presented. Monitoring tools for network operation and data quality, enable immediate application of G.I.'s techniques in order to correct the damages or errors occurred. General information on the network development as well as technical details for each station is included on the website and is available to the scientific community.

Since 2007, the seismological network of G.I. consists a part of the Unified National Seismological Network (UNSN), in collaboration with the seismological networks of the University of Thessaloniki, the University of Athens and the University of Patras, acting as a coordinator. Based on this framework, there is an opportunity to exchange and distribute data from more than 140 seismological stations operating in Greece in real time, so that the state and public information system operates on a 24/7 basis.

During 2017, in collaboration with the United Nations Organization CTBTO, the equipment of the seismological station of Anogeia, Rethymnon, was upgraded.

Using software tools and data from seismological stations and from auxiliary stations for accelerometers as well, for every earthquake having more than ML3.5 magnitude, the G.I.'s website is automatically updated, an e-mail is sent to the Euro-Mediterranean Seismological Center (EMSC) and the corresponding seismicity map of the Greek space which is uploaded on the specialized website of G.I. is renewed. For every earthquake having more than ML4.0 magnitude, a relevant announcement is issued by G.I., and information is sent to the operational responsible bodies (SGPP and EPPO).

For earthquakes having magnitude ML $\geq$ 3.5, provided that sufficient data are available, the seismic torque tensor is calculated, and thus is calculated the magnitude of seismic torque Mw and the mechanism of the earthquake's starting point. All data enriches a relevant database so that the site visitor can search for relevant information. The quality and quantity of the available solutions has significantly been increased since 2012, with the introduction into the calculations of data from the accelerator network and the use of a new relative algorithm for centered distances less than 100km. For the year 2017, 87 focal mechanisms were calculated and published by the relevant six-member group. Their relatively immediate calculation, especially in major seismic events, helped both in estimating the torque size and in estimating the level of the fissure/fault. During 2017, dozens of announcements were issued for corresponding seismic events having magnitude ML $\geq$ 4.0.

New software tools are tested in the computing center which has been developed and serves the Unified National Seismological Network (UNSN), the National Accelerator Network and the CGPS Network. The creation and the continuous improvement of the monitoring system of UNSN technically ("state of health"), and additionally the recording of the seismic noise and the stations' quality (PQLX tool), assist the day-to-day monitoring of the seismic activity. Such tools associate parameters recorded by different networks aiming the aim extracting of new knowledge (e.g. correlation between wave's heights recorded on accelerators in the Aegean and the Ionian Sea, and the recorded terrestrial noise in the UNSN stations.

Figure 4.1.1-1. Map of geographic distribution of all seismic stations whose data are transmitted in real time in the central facilities of the G.I.

Figure 4.1.1-2. The informative website for announcements of major seismic events.

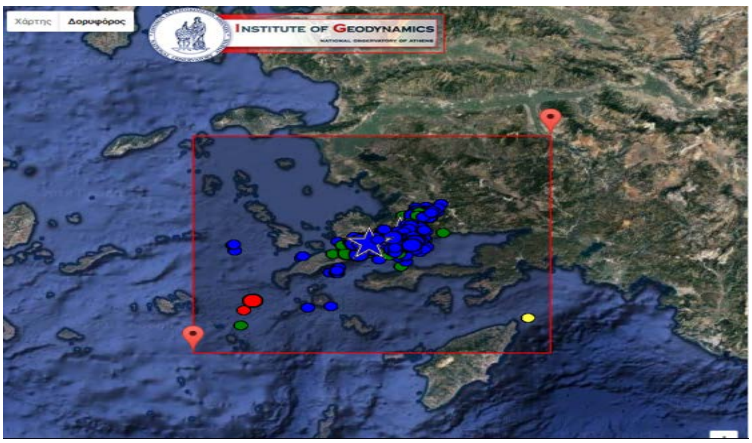

Figure 4.1.1-3. Snapshots from the seismological network website (http://bbnet.gein.noa.gr) depicting the seismic sequence in Kos for one month period from the main earthquake the occurrence (20/07 / 2017-20 / 08/2017)

National EIDA node

Seismic waveform data from seismological stations in Greece and the South East Mediterranean are included in the European Integrated Data Archive (EIDA), which operates at the G.I. since 2016. The European EIDA repository is a federated digital data center which archives and provides seismic waveforms and the related metadata from the European Research Infrastructure. The implementation and operation of the Hellenic National EIDA Regional Node is the first attempt, at national level, of unlimited provision and seamless access to seismic waveform data of the broader geographical area in the global research community (http://eida.gein.noa.gr).

Unhindered access to data has been provided so far of:

- the HL network with all seismic stations with broadband and strong motion sensors as well as selected independent stations with strong ground motion.
- the most seismological stations of the HP network of the University of Patras with broadband and strong motion sensors.
- the HC network with all seismic stations with wide range sensors.
- the HA network of the University of Athens with two stations.
- the Cyprus CQ network with eight broadband seismic stations and two underwater stations (OBS).
- the EUROSEISTEST EG network of strong territorial traffic.
- the ME's seismological network in Montenegro with one station.

Figure 4.1.2-1. Main hosting and informative webpage of the EIDA National Seismological Data (eida.gein.noa.gr).

Figure 4.1.2-2. Main website with the National EIDA in EAA as seen from the ORFEUS website.

Study of strong seismic motion

The magnitude of the disasters caused by a strong earthquake is often described by macroeconomic intensity on a 12-degree scale, which is determined after evaluating macroeconomic questionnaires. Due to the fact that from the perspective of scientists (seismologists, engineers, urban designers) a more objective measure of the territorial vibration is preferred, special seismographic instruments are used, the accelerometers, in order to provide an instrumental measure of this vibration at a specific location. The Geodynamic Institute has been operating a collection of macroseismic observations network since 1886 and a permanent network of accelerators since 1972. The Institute contributes to national (HEAD v1.0) and European efforts to develop strong seismic databases and thus to provide data for educational needs and related studies.

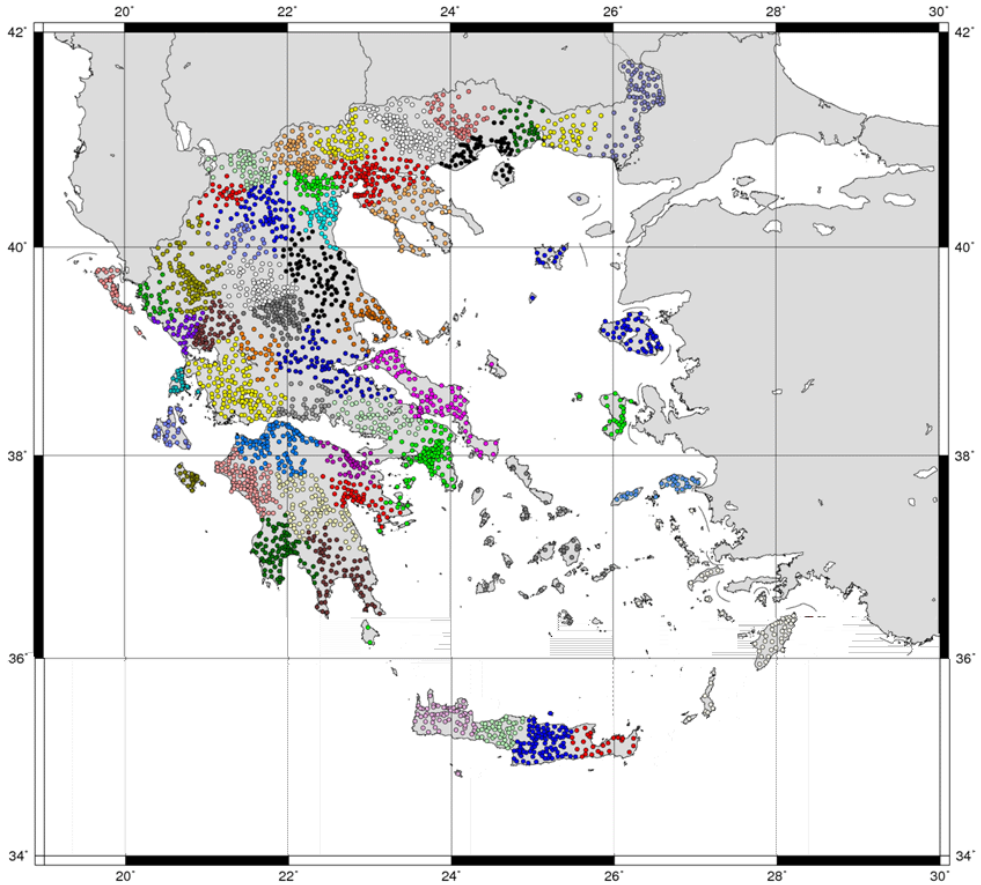

Figure 4.1.3-1. Map showing the locations of the agglomerations where questionnaires are sent on the impact of strong earthquakes for the collection of macro-spatial observations.

The Accelerator Network

The Geodynamic Institute operates a nationwide network of more than 150 recorders of strong seismic vibration (accelerators), with instrument installations mainly in urban centres, but also near major constructions or archaeological sites. More information about the developing of this network in different time periods and phases is referred into previous reports. The support provided by the SYZEFXIS network at the installation sites in OTE's buildings, where the replacement of the communication equipment is also supported, consists an important role.

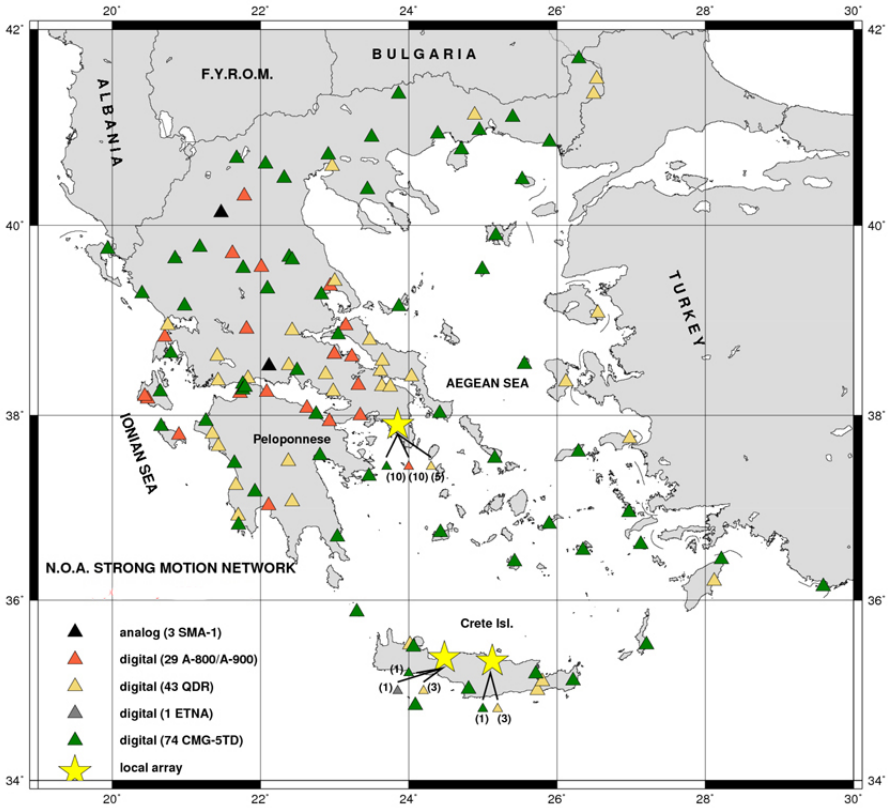

Figure 4.1.3-3. The Accelerator Network as it is set up by the end of 2013.

Examples, referred to as stations are: (a) Meganisi (MGNA), an important station in the area of Lefkada, which participates in the support of the day-to-day analysis, thus at the EIDA hub, under the responsibility of G.I. to provide its data at European level, is out of services for about one year and the earthquake of 17.11.2015 was not recorded, (b) Volimes of Zakynthos (VLMS) an installation along with a seismograph, which consists an important station in Zakynthos, is out of service for more than a year. Moreover, the effort to employ scientific staff of the G.I. in the processing of more than hundreds of records produced by the network, worked only occasionally due to the reduction in the number of staff and its strenuous engagement with the day-to-day analysis of seismicity and the 24-hour Institute's operational support.

In 2017, substantial maintenance works was carried out on the network of the Eastern Macedonia-Thrace Region (Alexandroupolis, Komotini, Xanthi, Kavala, Orestiada, Didymoticho, Trigono, Agios Efstratios) and occasional maintenance at stations in Western Greece (Lixouri, Argostoli, Patra , Rio, Zacharo).

The Geodynamic Institute has begun the pilot application of the ShakeMap® tool (Wald et al., 1999a, 1999b), which based on the real-time transmitted records of seismographs, creates, among other a ground vibration map, which potentially may be a map of the estimated impacts of a strong earthquake. In 2016, the instrument was further parameterized / calibrated to improve its credibility, as well as incorporating the tool into the Accelerator Network

website. However, after 4 years of application, it is clear the absence of dense network and data near the epicenter's region.
The enrichment of the network with new instruments and the upgrading of instruments operating for more than 20 years in critical locations have been planned under the GEORISK and HELPOS projects for the three-year period 2018-2020.

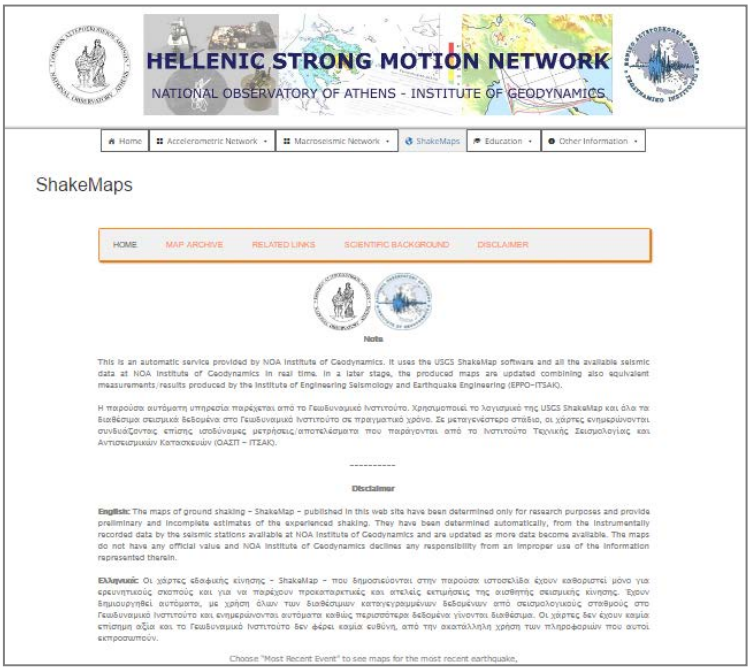

Figure 4.1.3-4 The introduction page of the application https://accelnet.gein.noa.gr/shakemaps/

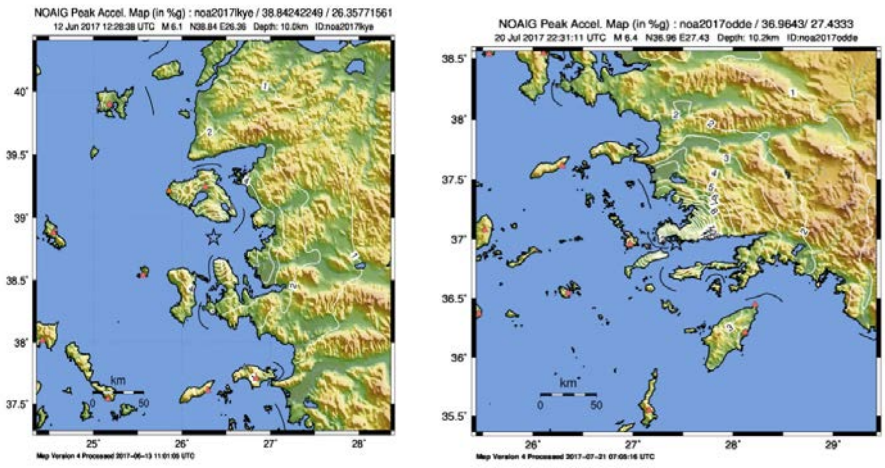

Figure 4.1.3-5 Example of the Earth Terrestrial Acceleration (PGA) map for Lesvos earthquakes (12/06, M6.1) and Kos (20/7, M6.4).

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Current Situation of the DGG-SL Seismological Network

During the period 2015-2018, some changes took place in the seismological network of the DGG-SL. Specifically; changes were made in the instrumentation of some of them, while some others were closed. Table (1) gives information on the current instrumentation of each station. The stations that closed over the last 4 years are marked with gray shadows. The map of figure (1) displays the current spatial distribution of the stations of the DGG-SL seismological network.

Table 1.- Changes/upgrades which took place during the period 2015-2018 and the current status of the seismological stations, that are maintained by the Department of Geophysics-Geothermics, Seismological Laboratory (DGG-SL).

Code	Name	Start Date	End Date	Lat.	Lon.	Sensor	Digitizer	Status
ATHU	Athens University	3/13/2008	3/5/2008	37.966	23.7845	CMG-3T/120 L	REF130	present
		3/5/2008	4/10/2009	37.966	23.7845	CMG-40T/30	REF72A	
		4/10/2009	4/15/2009	37.966	23.7845	CMG-3ESPC/60	REF72A	
		4/15/2009	**now**	37.966	23.7845	CMG-40T/60	REF72A	
ACOR	Acrocorinthos	12/29/2008	8/5/2009	37.890	22.869	LE-3D/5	REF72A	present
		8/5/2009	6/14/2013	37.890	22.869	CMG-40T/30	REF72A	
		6/14/2013	**now**	37.890	22.869	CMG-40T/30	CMG-DM24S6-EAM	
ATAL	Atalanti	9/26/2007	6/2/2010	38.692	23.021	CMG-40T/60	REF130	present
		6/2/2010	8/21/2010	38.692	23.021	CMG-3T/120 L	REF130	
		8/21/2010	11/23/2012	38.692	23.021	CMG-40T/30	REF130	
		11/23/2012	**now**	38.692	23.021	CMG-3T/120 L	CMG-DM24S6-EAM	
AXAR	Ag. Haralambos	3/12/2008	**now**	38.766	22.659	CMG-40TD/30	CMG-DM24	present
DESF	Desfina	6/11/2008	2/6/2011	38.412	22.532	CMG-40TD/30	CMG-DM24	closed
DIDY	Didyma	10/13/2008	11/20/2008	37.476	23.211	CMG-40TD/30	CMG-DM24	closed
		11/20/2008	4/16/2009	37.476	23.211	LE-3D/5	REF72A	
		4/16/2009	10/13/2010	37.476	23.211	CMG-3ESPC/60	REF72A	
EPID	Epidavros	10/8/2010	7/19/2011	37.614	23.118	CMG-40T	REF130	present
		7/19/2011	**now**	37.614	23.118	CMG-40T/30	CMG-DM24S6-EAM	

EREA	Eretria	6/16/2010	11/19/2014	38.419	23.931	CMG-40T/30	REF72A	present
		11/19/2014	**now**	38.419	23.931	CMG-40T/30	REF130	
ERET	Eretria	12/23/2008	8/4/2009	38.442	23.806	CMG-40T/30	REF72A	closed
		8/4/2009	2/24/2010	38.442	23.806	LE-3D/5	REF72A	
FYTO	Fytoko	7/2/2008	10/13/2009	39.408	22.939	CMG-40T	REF72A	closed
		10/13/2009	7/14/2013	39.408	22.939	CMG-40TD/30	CMG-DM24	
KALE	Kallithea	9/5/2007	5/14/2013	38.391	22.139	CMG-40T/60	REF130	present
		5/14/2013	4/5/2017	38.391	22.139	CMG-3T/120 L	CMG-DM24S6-EAM	
		4/5/2017	**now**	38.391	22.139	TRILIUM 40	CMG-DM24S6-EAM	
KARY	Karystos	6/16/2010	7/11/2013	38.0321	24.437	CMG-40TD/30	CMG-DM24	present
		7/11/2013	**now**	38.032	24.437	CMG-40T/60	CMG-DM24S6-EAM	
LAKA	Lakka	9/5/2007	9/2/2009	38.240	21.978	CMG-40T/60	REF130	present
		9/2/2009	7/2/2010	38.240	21.978	CMG-3T/120 L	REF130	
		7/2/2010	3/22/2012	38.240	21.978	CMG-3T/120 H	CMG-DM24	
		3/22/2012	12/13/2012	38.240	21.978	CMG-40T/60	CMG-DM24	
		12/13/2012	1/28/2015	38.240	21.978	CMG-3T/120 L	CMG-DM24	
		1/28/2015	**now**	38.240	21.978	CMG-3T/120 H	CMG-DM24	
LOUT	Loutraki	5/27/2010	7/19/2011	37.987	22.974	CMG-40T/30	REF72A	present
		7/19/2011	**now**	37.987	22.974	CMG-40T/30	CMG-DM24S6-EAM	
LTRA	Loutraki	3/14/2008	2/1/2010	37.975	22.976	CMG-40TD/30	CMG-DM24	closed
MAKR	Makrakomi	6/19/2008	11/2/2012	39.013	22.131	CMG-40T/30	REF130	present
		11/2/2012	8/12/2013	39.013	22.131	CMG-3T/120 L	CMG-DM24S6-EAM	
		8/12/2013	10/2/2014	39.013	22.131	CMG-40T	CMG-DM24S6-EAM	
		10/2/2014	**now**	39.013	22.131	CMG-40T/30	CMG-DM24S6-EAM	
MRKA	Markates	10/16/2008	11/19/2014	38.705	23.587	CMG-40TD/30	CMG-DM24	present
		11/19/2014	**now**	38.704	23.584	CMG-40T	REF72A	
MRMA	Marmari	10/14/2008	4/6/2010	38.057	24.379	CMG-40TD/30	CMG-DM24	closed
PROD	Prodromos-Domvrena	7/2/2010	**now**	38.258	22.900	LE-3D/5	REF72A	present
SERI	Serifos	7/28/2010	**now**	37.160	24.485	CMG-	CMG-DM24	present

						40TD/30		
SKIA	Skiathos	6/25/2008	9/21/2010	39.166	23.466	CMG-40T/30	REF130	present
		9/21/2010	6/30/2013	39.166	23.466	CMG-40T/60	REF130	
		6/30/2013	**now**	39.166	23.466	CMG-40T/60	CMG-DM24S6-EAM	
SMIA	Simia	10/16/2008	**now**	38.879	23.209	CMG-40TD/30	CMG-DM24	present
SNT1	Santorini -1-Gialos	7/7/2011	4/26/2014	36.416	25.428	CMG-40T	REF130	present
		4/26/2014	**now**	36.415	25.428	CMG-40T/30	REF130	
SNT2	Santorini -2-Vlychada	7/5/2011	4/26/2014	36.339	25.432	CMG-40T	REF72A	closed
SNT3	Santorini -3-Karterados	5/26/2011	7/5/2011	36.413	25.447	CMG-40T	REF130	closed
		7/5/2011	12/14/2012	36.413	25.447	CMG-40T	REF72A	
		12/14/2012	4/25/2014	36.413	25.447	CMG-40T/30	REF130	
		4/25/2014	**now**	36.413	25.447	CMG-40T	REF130	
SNT5	Santorini -5-Nea Kammeni	4/24/2014	**now**	36.403	25.395	CMG-40T/1	REF130	present
THAL	Thalero	6/12/2008	6/14/2013	38.037	22.663	CMG-40T/30	REF72A	present
		6/14/2013	**now**	38.035	22.663	CMG-40T/30	CMG-DM24S6-EAM	
TRAZ	Trapeza	9/27/2010	2/7/2013	38.168	22.212	CMG-40T/30	REF72A	closed
		2/7/2013	10/3/2013	38.168	22.212	CMG-40T/30	CMG-DM24S6-EAM	
TRIP	Tripoli	6/27/2010	7/8/2010	37.510	22.362	CMG-40TD/30	CMG-DM24	present
		7/8/2010	**now**	37.527	22.270	CMG-40TD/30	CMG-DM24	
VIL2	Platees	12/29/2008	8/13/2009	38.211	23.268	CMG-40T/30	REF72A	closed
VILL	Villia	10/12/2009	11/8/2012	38.164	23.312	CMG-40T/30	REF72A	present
		11/8/2012	**now**	38.164	23.312	CMG-40T/30	CMG-DM24S6-EAM	

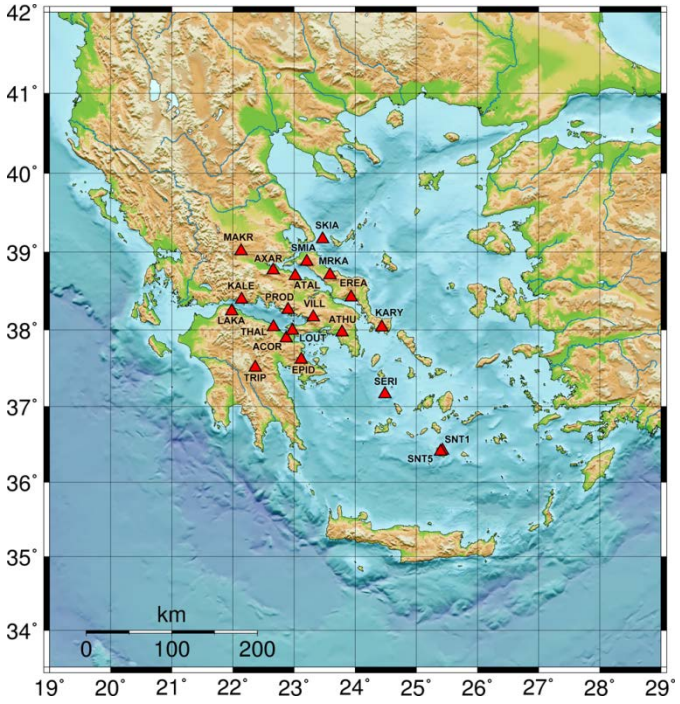

Figure 1.- *The Seismological Laboratory of the N.K.U.A. serves a network consisting of 21 seismological stations, mostly covering the Central Greece.*

PUBLICATIONS

FULL TEXT PAPERS

1) V. Antoniou, S. Mavroulis, N.-I. Spyrou, P. Bardouli, E. Andreadakis, E. Skourtsos, G. Kaviris, V. Sakkas, P. Carydis and E. Lekkas, 2018. Storytelling Technologies for Dissemination of Scientific Information of Natural Disasters: The June 12, 2017, Mw 6.3 Lesvos (Northeastern Aegean, Greece) earthquake story map. Full Paper, Proceedings of the 9th International INQUA Meeting on Paleoseismology, Active Tectonics and Archeoseismology (PATA), 25 – 27 June, 2018, Possidi, Greece, p. 10-13.
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3. I. Fountoulakis and G. Kaviris, 2018. Preliminary results of crustal structure variations in Greece deduced by P-receiver functions. Abstract, 36th ESC General Assembly, Valetta, Malta, ESC2018-S23-251.
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6. I. Kassaras, D. Kazantzidou-Firtinidou1, D. Kalantoni, A. Ganas, A. Pomonis, M. Gaspari, G. Giannaraki, P. Kalantonis, C. Karakostas, G. Kaviris, V. Kouskouna, E. Lekkas, K. Makropoulos, K. Michalaki, S. Mourloukos, D. Psarris, N. Sakellariou, G. Sakkas, P. Stoumpos, C. Tsimi and S. Valkaniotis, 2017. Modelling Seismic Risk in Greece Methodology, Applications, Perspective. Abstract, Safe Athens 2017, Athens, 28-30 June 2017, p. 36.
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Current Situation of the DG-AUTh Seismological Network

During the period 2015-2018, some changes took place in the seismological network of the DG-AUTh. Specifically, new stations were installed, some others were closed, while changes were made in the instrumentation of some of them.

Table (1) gives information on the current instrumentation of each station. The last two columns list the dates (Da.Mo.Yr) on which the respective instrumentation was installed (START) and replaced (STOP). The stations that closed over the last 4 years are marked with gray shadows.

The map of figure (1) represents the (present) spatial distribution of the stations-members of our seismological network.

Table 1.- *Changes/upgrades of the seismological stations, that are served by the Geophysical Laboratory of A.U.Th., which took place during the period 2015-2018.*

N	CODE	SENSOR	CONTR	DIGITIZER	START	STOP
1	AGG	CMG-3ESP/100sec	JANUS	TRIDENT	31.05.16	08.11.16
		CMG-40T/30sec	JANUS	TRIDENT	08.11.16	22.09.17
		Trillium 120P	JANUS	TRIDENT	22.09.17	05.09.18
		Trillium 120P	-	CENTAUR	05.09.18	present
2	ALN	CMG-3ESP/100sec	JANUS	TRIDENT	29.05.14	present
	AOS	CMG-3ESP/100sec	-	TAURUS	08.07.18	closed
3	AOS2	CMG-3ESP/100sec	-	CENTAUR	09.07.18	present
4	CHOS	CMG-3ESP/100sec	-	CENTAUR	28.11.14	present
5	FNA	CMG-40T/30sec	-	HRD-24	03.11.16	present
6	GRG	CMG-3ESP/100sec	-	TAURUS	31.07.13	present
7	HORT	CMG-3ESP/100sec	JANUS	TRIDENT	02.03.16	present

N	CODE	SENSOR	CONTR	DIGITIZER	START	STOP
8	**IGT**	CMG-3ESP/100sec	-	HRD-24	21.10.08	present
9	**KAVA**	Trillium120P	-	CENTAUR	29.06.16	present
10	**KNT**	CMG-3ESP/100sec	-	HRD-24	21.07.08	present
11	**KOKK**	Trillium120 comp.	-	TAURUS	01.03.17	present
12	**KPRO**	CMG-3ESP/100sec	-	TAURUS	18.01.13	present
13	**KRND**	CMG-3ESP/100sec	-	TAURUS	25.11.13	present
14	**KTI**	S-13	JANUS	TRIDENT	04.05.11	present
15	**LESV**	Trillium120C	-	TAURUS	26.06.17	present
16	**LIT**	CMG-3ESP/100sec	JANUS	TAURUS	23.02.18	present
	LKD	CMG-3ESP/100sec	JANUS	TRIDENT	29.05.08	closed
17	**LKD2**	CMG-3ESP/100sec	JANUS	TRIDENT	03.04.09	present
18	**LOS**	S-13	JANUS	TRIDENT	21.04.08	present
19	**LRSO**	CMG40T/1sec	-	REFTEK	06.07.11	present
	MEV	S-13	JANUS	TRIDENT	01.12.15	closed
20	**NEST**	Trillium120P	JANUS	TRIDENT	25.09.13	present
21	**OUR**	CMG-3ESP/100sec	-	CENTAUR	02.09.14	present
22	**PAIG**	CMG-3ESP/100sec	-	TAURUS	07.11.17	present
23	**SIGR**	CMG-3ESP/100sec	JANUS	TRIDENT	25.5.10	present
24	**SOH**	Trillium120P	-	TAURUS	10.07.14	present
25	**SRS**	CMG-	JANU	TRIDENT	15.07.08	present

N	CODE	SENSOR	CONTR	DIGITIZER	START	STOP
		3ESP/100sec	S			
26	**THAS**	CMG-3ESP/100sec	-	TRIDENT	04.07.12	present
27	**THE**	CMG-3ESP/120sec	JANUS	TRIDENT	20.10.15	18.12.15
		CMG-6T/30sec	JANUS	TRIDENT	18.12.15	present
28	**TYRN**	Trillium120P	-	TAURUS	14.12.15	16.12.16
		Trillium120P	-	CENTAUR	16.12.16	present
29	**XOR**	CMG-3ESP/100sec	-	TAURUS	23.01.08	present
Local network of Santorini Isl.						
30	**CMBO**	Trillium120P	-	TAURUS	25.03.15	present
31	**STAX**	CMG40T/30sec	-	DM24	30.03.12	present
	THR1	S-13	JANUS	TRIDENT	16.03.10	closed
32	**THR2**	S-13	JANUS	TRIDENT	16.03.10	present
33	**THR3**	S-13	JANUS	TRIDENT	16.03.10	present
	THR4	S-13	JANUS	TRIDENT	02.06.08	closed
34	**THR5**	S-13	JANUS	TRIDENT	16.03.10	present
35	**THR6**	S-13	JANUS	TRIDENT	16.03.10	present
	THR7	S-13	JANUS	TRIDENT	25.11.15	closed
36	**THR8**	S-13	JANUS	TRIDENT	12.12.11	present
37	**THR9**	S-13	JANUS	TRIDENT	13.12.11	present
38	**THT1**	S-13	-	SMART24	10.09.14	present

N	CODE	SENSOR	CONTR	DIGITIZER	START	STOP
39	**THT2**	CMG-3ESP/120sec	-	REFTEK130	25.10.15	present
Local network of Nissiros Isl.						
40	**NIS1**	CMG-3ESP/100sec	-	TAURUS	24.05.08	present
Local network of Cephalonia-Lefkada Isl.						
41	**DMLN**	CMG40T/1sec	-	REFTEK130	19.09.14	present
42	**DRAG**	LE-3D/1	-	REFTEK130	24.03.15	25.04.16
		CMG40T/1sec	-	REFTEK130	25.04.16	present
43	**EVGI**	CMG40T/30sec	-	REFTEK130	10.07.14	present
44	**NYDR**	CMG40T/1sec	-	REFTEK130	01.04.16	present
45	**PSDA**	CMG40T/30sec	-	REFTEK130	10.10.14	present
46	**TSLK**	CMG40T/1sec	-	REFTEK130	09.10.12	present
47	**RTZL**	Trillium TC120-SV1	-	REFTEK130	14.06.18	present

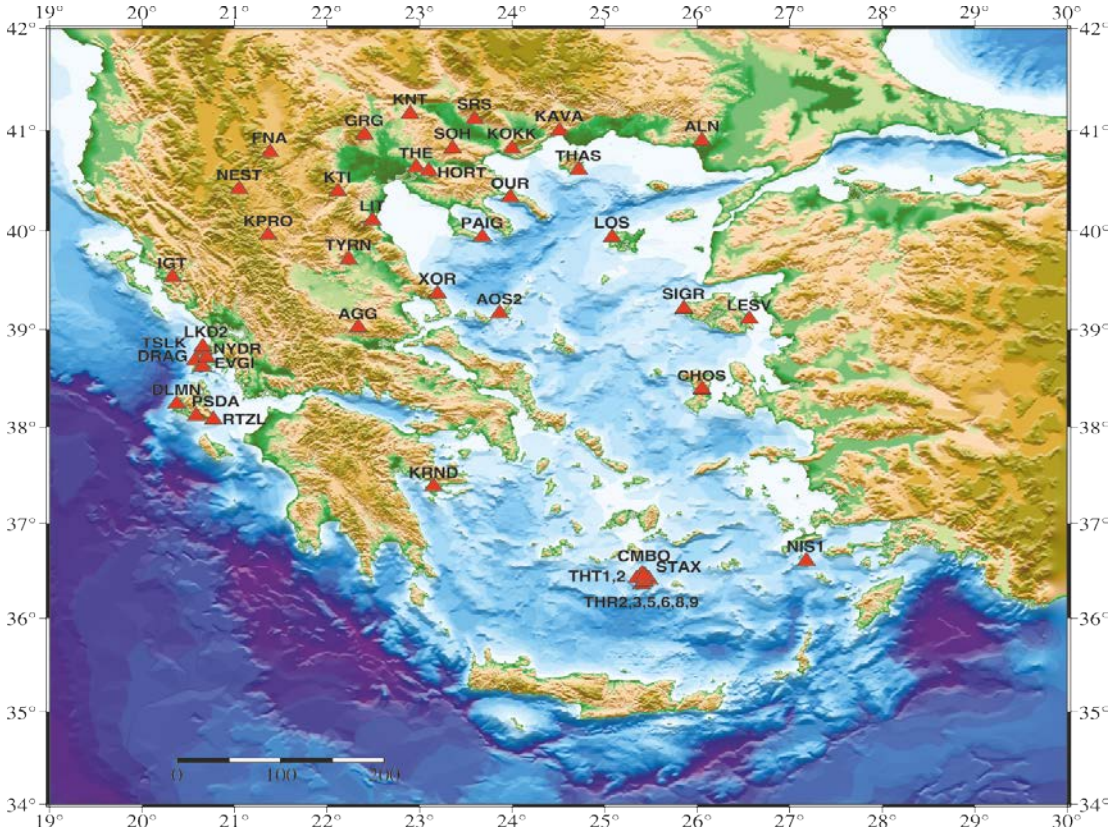

Figure 1.- *The Geophysical Laboratory of A.U.Th. serves a network consisted of 47 seismological stations covering the major part of Greece.*

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PRESENTATIONS/POSTERS IN INTERNATIONAL CONGRESSES

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EDITORIAL BOARDS, BOARD OF DIRECTORS, ADMINISTRATIVE COUNCILS

Papadimitriou:

1) Editor in Chief: Acta Geophysica
2) Associate Editor Bolletino di Geofisica Teorica e Applicata

3) Charing the IASPEI Subcomission: Modeling and Monitoring for Prediction – Commission on Earthquake Sources
4) Scientific Council of the Centre of Integrated Geomorphology for the Mediterranean Area (CGIAM) – Potenza, Italy (2011–).
5) Advisory Working Group of the platform "Environment and Sustainable Development" under the Research and Innovation Strategy for Smart Specialisation program period 2014–2020.
6) Member of the board for directors of Thessaloniki State Symphony Orchestra, (2016–).

Tsapanos
7) Editorial Board of Open Journal of Earthquake Research (OJER).

INTERNATIONAL RESEARCH PROJECTS

1. The soil science and archaeo-geophysics alliance: going beyond prospection (SAGA). Cost action 2018-2022 *(E. Aidona)*
2. An updated 3D Seismotectonic-Geophysical Model for the deterministic hazard assessment of the Southern Aegean subduction (3D-SEGMENTS) *(E. Karagianni, D. Vamvakaris)*
3. Assessment of Earthquake loading and seismic response of the Trans-Adriatic Pipeline (TAP) *(D. Vamvakaris)*
4. RECALL-Resilient European Communities Against Local Landslides. European Commission DIRECTORATE-GENERAL HUMANITARIAN AID AND CIVIL PROTECTION-ECHO 3 May 2015 – 3 May 2017 *(T. Tsapanos)*.
5. INTERREG IV – "Joint Cross Border Cooperation for Securing Societes Against Natural and Man Made Disasters" / J-CROSS 04/07/2018 – 03/01/2020 *(T. Tsapanos)*.

EARTHQUAKE PLANNING
& PROTECTION ORGANISATION OF GREECE
(E.P.P.O.)

Earthquake Planning and Protection Organisation of Greece (E.P.P.O.) was established in 1983 as a Legal Entity of Public Law and operates under the supervision of the Ministry of Infrastructure & Transportation. During the last 35 years, E.P.P.O. is responsible for the design and implementation of the earthquake national policy during the pre-seismic (ex ante), seismic (on going) & post-seismic (ex post) phases.

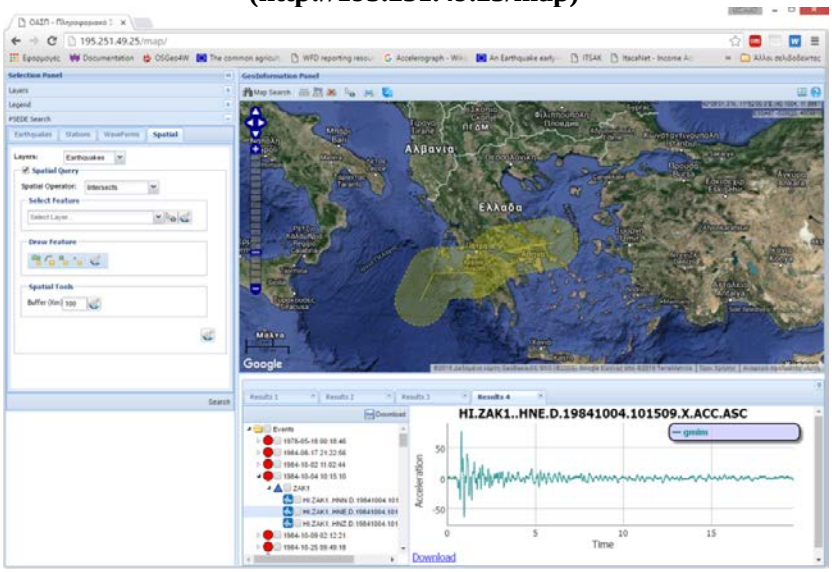
European Centre on Prevention and Forecasting of Earthquakes (E.C.P.F.E.) operates under the Open Partial Agreement (OPA) of the Council of European Union to deal with Major Hazards and is included in the network of the 27 specialised Euro-Mediterranean Centres. It was established in 1987 and operates since then under the administrative and financial support of the Council of European Union and E.P.P.O. The Centre contributes to the development of practices and methods for the management of seismic disasters, organises informative events, publishes informative material and promotes cooperation and policies on issues related to its objectives with the European Centres of the OPA and International Organisations as well.

Pre-seismic period (ex ante)

1. Seismic Hazard Assessment

- EPPO has financially supported the Hellenic Unified Seismic Network (HUSN) which provides in near real time waveform data exchange and consists of the Seismic Networks of Athens, Thessaloniki and Patras Universities and National Observatory of Athens-Institute of Geodynamics as the coordinator.
- EPPO has established the Greek Accelerometric Network, a project funded by the "National Strategic Reference Framework (NSRF) 2007-2013". The subproject "Gis HEllenic Accelerograms Database - GHEAD" is operational and accessible through the address " http://195.251.49.25/map/". GHEAD is a new web-based tool, developed in order to provide scientists and engineers with the ability to search, use and download all the necessary information regarding the records of the Greek Accelerometric Network. Although many similar applications exist, GHEAD unique functionality combines workflows derived from Geographical Information Systems and associated spatial Web Services together with the detailed and up to date seismological information of E.P.P.O. in order to better respond in earthquake crisis situations. This tool allows any user to download for free all the records of the Greek Accelerometric Network and also to "consume" the Open Geospatial Consortium (OGC)/ INSPIRE Web Services referring to seismic events and stations of the network. GHEAD's Spatial Data Infrastructure is designed to meet the needs of E.P.P.O. allowing the development of additional procedures for spatial data publishing either to fulfill its usual activities or to support emergency operations.

Greek Accelerometric Network Information System
(http://195.251.49.25/map)



2. Implementation of earthquake safety codes and regulations for structures

- Coordination of the elaboration of the Greek Earthquake Design Code (EAK 2000) and the Greek Code of Reinforced Concrete (EKOS 2000).
- Code of Structural Interventions on Reinforced Concrete Buildings (K.A.N.E.P.E. 2017)
- Code of Interventions on Masonry Buildings (K.A.D.E.T. 2017)
- Pre-earthquake Inspection of Existing Buildings
  - A. First degree pre–earthquake Inspection of Buildings for Public Use
  - B. Second degree pre–earthquake Inspection of Buildings for Public Use
- Seismic Risk Assessment of Infrastructures
  - A. Earthquake Resistance Capacity of Infrastructures
  - B. Pre-earthquake Inspection of Bridges
- Building Seismic Regulation
- Technical Instructions for Risk Elements Removal Temporal Support and Propping
- Assessment of residual bearing capacity of buildings with damages after an earthquake
- Earthquake Protection of Cultural Heritage
- Regulatory Framework for Structural Interventions in Monuments
- Second Degree Pre–earthquake Inspection of Masonry Buildings

3. **Support public agencies and local authorities in implementing earthquake emergency plans**

EPPO in cooperation with the Civil Protection Departments of the Decentralized Administrations of the country took over the responsibility to organise earthquake workshops at municipal level across the country. Workshops involve competent executives of Municipalities and Regions (Regional Districts) on Emergency Management issues, as well as representatives of stakeholders.

A. ***Operational Earthquake Planning Workshops at Municipal Level***

A total of 17 Operational Planning Workshops have been implemented for earthquake throughout Greece for all the Municipalities of the country, ie 325 Municipalities. 76% of municipalities participated with their representatives

B. ***Operational Earthquake Preparedness for Municipalities of the Seismic Hazard Zone III (Ionian Islands)***

EPPO took the initiative to organize Earthquake Planning Workshops in each of the Seismic Risk Zone III. This action was launched in 2015 and was completed in 2016. Furthermore, EPPO drew up the Annual Report "Earthquakes of Kefalonia: 2 years later - Evaluation of Operational Actions" dedicated to the 2014 earthquake that hit the island during a Workshop in Argostoli. Its main objective was to assess the operational actions of all actors involved in the crisis management.

C. ***Participation of EPPO representatives in Coordination Bodies in case of an Earthquake***

EPPO participated at the meetings of the Civil Protection Co-ordination Bodies at the level of the Regions and the Local Coordination Bodies at the level of the Municipalities. The EPPO representatives contributed on issues of operational preparedness of regional and local authorities.

4. **Civil Protection Exercises**

Co-ordination of Earthquake Operational Exercises

- Earthquake Operational Exercise "EVPALINOS 2015" – Samos Island
- Earthquake Operational Field Exercise "TILEMACHOS 2015" – Zakynthos Island
- Earthquake Operational Exercise PAN-IONIA - "LEFKADIOS 2016" – Lefkada Island
- Earthquake Operational Field Exercise "EVPALINOS 2017" – Samos Island
- Earthquake Operational Exercise - Piraeus 2017

Participation of EPPO in Earthquake Operational Exercises

- Earthquake Exercises in Spata-Artemis Municipality 2015, Peristeri Municipality 2016
- Earthquake Operational Field Exercise «POSEIDON 2» 2016 - Thessaloniki
- Earthquake Operational Field Exercises SEISICHTHON 2015, 2016 & 2017
- Earthquake Exercises in hospitals (Amalia Fleming Prefecture General Hospital of Melissia & Elefsis General Hospital 2017)
- Earthquake Exercises ShakeOut 2016 & 2017 in EPPO Headquarter.

European Union Civil Protection - National Medium Urban Search and Rescue Team -1 & 2 (MUSAR)

EPPO Civil engineers are staffing the MUSAR-1 & 2 Civil Protection Units which are declared National Units for Civil Protection in the European Civil Protection Mechanism together with Special Units for Disaster Response (EMAK) and National Emergency Aid Centre (E.K.A.B). These units operate in accordance with the international INSARAG protocol and can be mobilized in emergencies inside and outside the European Union.

5. <u>Collaborations – Representations - EPPO Personnel Training</u>

- United Nations Organization (UN) - New Framework for Sentai Disaster Risk Reduction 2015-2030
- Organization of the Black Sea Economic Cooperation (OSEP), 2015-2016-2017
- European Mass Shelter Capability Program (MASC), 2016
- United Nations (UN) - New Framework for Risk Reduction Sentai Disaster 2015-2030 - National Disaster Risk Reduction Platform, 2016
- Work meeting on "The role of children in disaster management", 2017
- Participation of EPPO experts in “Expert Exchange Programme”, “Expert Missions and Seminars” and “Exercises” of the European Civil Protection Mechanism
- "Exchange of Experts" in Portugal 2015 & Spain, 2017
- Participation of EPPO in the mission of Experts of the European Civil Protection Mechanism in Italy & Ukraine, 2016
- European Civil Protection Exercise "WESTSUNAMI 2015"
- EU Technical Expert Seminar 2016, 2017
- EU High Level Coordination Refresher Course, 2016
- EU Course on Negotiation and Decision Making, 2017
- EU Assessment Mission Course - AMC, 2017
- UN Environment / OCHA / ECHO Seminar (UN EC-EET), 2017

6. <u>Educate the public on earthquake protection measures</u>

EPPO designs and implements actions that improve public awareness and knowledge about seismic risk. To this purpose, teachers, students, employees, workers, volunteers, people with disabilities are informed and trained on earthquake protection measures (Public Speeches and Presentations, TV Social Messages, Information Campaign in collaboration with Public Transport Company, Informative Leaflets, EPPO’s website http://www.oasp.gr/inform/general_population).

- Educational programmes for teachers and schoolkids of all grades
    - Seminars on earthquake protection of schools
    - Plan of Actions for seismic risk management at schools
    - Earthquake exercises in schools
    - Educational material on earthquake protection measures
- Educational material at Prevention Web managed by the UN Office for Disaster Risk Reduction (UNISDR) (https://www.preventionweb.net/english/countries/europe/grc/?)
- Educational programmes and training exercises for employees, hoteliers and tourists
- Special educational programmes and training exercises for people with disabilities

- Training seminars for volunteers

7. **Coordinate and support applied research on seismic hazard and risk**
   - EPPO has established a Digital Library of the Applied Research Programmes funded by the Organisation. The Library is available through the EPPO Website (http://www.oasp.gr/assigned_programs)
   - Participation in European Programmes
     - IDIRA: Interoperability of data and procedures in large-scale multinational disaster response actions (http://www.idira.eu)
     - E-PreS: Monitoring and Evaluation of Natural Hazard Preparedness at School Environment (http://e-pres.di.uoa.gr)
     - Enhancing Volunteer Awareness and Education against Natural Disasters while E-learning (EVANDE) (http://www.evande.eu)
     - Preparedness for Appropriate Accommodation in Emergency Shelters (PACES) (http://www.paces-project.eu/index.php/en/)
     - Telemachus - Innovative Operational Seismic Risk Management System of the Ionian Islands Region

Seismic period (on going)

- 24/7 shift for earthquake alert stronger than 4R. Provide information concerning the situation in the affected area to the decision makers (http://www.oasp.gr/earthquakes_map)
- In case of a strong earthquake with impacts on infrastructures, buildings and population, a team of EPPO experts is deployed in the affected area participating in the scientific assessment and providing assistance to the local authorities.
- Informing the local population about earthquake protection measures

EPPO Missions:

- ***Seismic activity in Northern Evoikos Gulf, 2015, M_L= 5.3 (http://www.oasp.gr/node/3657)***
  On Tuesday June 9 at 4:09 am Athens time, a strong earthquake occurred in Northern Evoikos Gulf, 26km NW of Chalkida with a magnitude of 5.3. The earthquake was strongly felt in the wider area without causing any damage. This earthquake was located at the same focal area as the 2014 earthquakes (M_L=5.2). EPPO contacted immediately after all the actors involved and monitored the evolution of the situation. EPPO had already installed since November 2014 a portable seismological network in collaboration with the Laboratory of Geophysics of the National Kapodistrian University of Athens to monitor the evolution of the seismic activity of the area. EPPO representatives consulted the local authorities about the seismic risk and the corresponding safety measures. School teachers were also constantly informed and trained.

- ***Seismic activity in Lefkada, 2015, M_L= 6.0 (http://www.oasp.gr/node/3659)***
  On Tuesday, November 17 at 9:10 am Athens time, a very strong earthquake of magnitude 6.0 hit the Lefkada Island (Ionian Sea). Two people lost their lives while buildings were damaged and rockfalls occurred at the southern part of the island. The President of EPPO BoD Professor Efthimios Lekkas, the General Manager Nikitas Papadopoulos and a team of experts participated at the meetings of the Local Coordination Body, assessing the evolution of the situation, keeping the decision makers informed, supporting Regional and Local Authorities to manage the impacts and informing the local people about protection measures.

Damages in buildings and churches (Southern part of Lefkada Island, 2015)

- ***Seismic activity in Ioannina**, 2016, M_L= 5.3 (http://www.oasp.gr/node/3658)*
  On Saturday, October 15 at 20:14 Athens time, a strong earthquake of magnitude 5.3 hit an area located 12 km NW of Ioannina town followed by an intense aftershock sequence, causing limited rockfalls on several mountain roads. The President of EPPO BoD Professor Efthimios Lekkas visited the region to assess the situation and to support Regional and Local Authorities managing the impacts.

- ***Seismic activity in Lesvos, 2017, M_L = 6.1 (http://www.oasp.gr/node/3649)***
  On Monday, June 12 at 15:28 Athens time, a very strong earthquake of magnitude 6.1 hit Lesvos Island (East Aegean Sea). One person was killed at Vrissa village (southern Lesvos) while the majority of the village was completely destroyed, leaving dozens of the residents homeless. The President of EPPO BoD Professor Efthimios Lekkas and an EPPO team of experts went to the affected area of Lesvos to assess the situation and to support Regional and Local Authorities managing the impacts. The President of EPPO BoD Professor Efthimios Lekkas participated at the Civil Protection Coordination Body for decision-making on proposals for mitigation measures and disaster management (immediate evacuation of Vrissa village due to extensive damages, urgent housing of the residents, controlled access to the village etc.). EPPO was also informing the decision makers on aftershock sequence and strong ground motion data. EPPO coordinated the information of the population on self-protection issues and provided guidelines for mitigating the psychosocial impact of the post-seismic period at Polichnitos Municipality.


Collapsed buildings in Vrissa village (Lesvos Island, 2017)

- ***Seismic activity in Kos, 2017, M_L= 6.2 (http://www.oasp.gr/node/3656)***
  On Friday July 21, at 01:31 am Athens time, a very strong earthquake of magnitude 6.2 occurred in the sea NE of Kos Island. Two people lost their lives in Kos city and dozens were injured while the main port of the island was damaged as well as several cultural heritage sites such as the sanctuary of St. Nicholas Metropolitan Church and part of a mosque in Liberty Square. The President of EPPO BoD Professor Efthimios Lekkas with three teams of experts went to the affected area in order to:
  - Deploy a portable seismological network of five stations to monitor the evolution of the aftershock sequence as well as the strong ground motion.
  - Cooperate with regional and local authorities to support the disaster management. Particular importance was given to hotels and the cultural heritage monuments due to intense tourist traffic on the island.
  - Inform the population about earthquake protection measures, especially the tourists through brochures edited in six languages.

Damages in cultural heritage monuments (City of Kos, 2017)

- ***Santorini Volcano Monitoring***
  EPPO took the initiative to establish the Greek Scientific Committee for Santorini Unrest in 2012 in order to monitor the Santorini volcanic activity. The Committee is in close collaboration with institutes from Greece and abroad(Charokopio University – Greece, Georgia Tech Institute of Technology – USA, Oxford University – UK, INGV – Italy, etc).These research institutes had already set up networks for the monitoring of volcanic activity (seismological, geodetic, chemical etc). The Commission informs the decision makers on the evolution of the phenomenon regularly.

Post-Seismic period (ex post)

Working groups on scientific issues in the aftermath of Kefalonia earthquakes (2014)
The results of the working group on "Correlation of the pre-earthquake and post-issmic elements of Kefalonia buildings after the earthquakes in January and February 2014" were submitted to EPPO in 2015.
The study of the University of Patras on “Behaviour of the 1953-1963 residence buildings during Kefalonia earthquakes January - February 2014” was completed in 2016.

Scientifique events

Workshops - Seminars

- Workshop "Obvious and Unsupported Monument Support", 2015
- Educational Program on the Protection of Critical Infrastructure, 2015
- "Lefkada - the earthquakes and their impact - Earthquake experiments - the management of recent seismicity", 2016
- Workshop "Operational Planning for earthquake PE Cyclades - Emergency Plans for Natural Disasters ", 2016
- October 13 - International Day for the Reduction of Disaster Risk, 2016
- Conference "Health and Safety at Work & Civil Protection", 2016
- Civil Protection Workshop "The Management of Natural Hazards in Crete", 2016
- Informative event "EARTHQUAKE: Knowledge fights panic", 2016
- Workshop "Seismic Risk Management at Municipality level", 2017
- Seminar "Preparedness in a moment of crisis in the Cyclades islands", 2017

Conferences

- ITA WTC 2015 Congress "SEE Tunnel: Promoting Tunneling in the SEE Region", 2015
- International Conference: "SafeChania 2015: The Triangle of Knowledge in the Service of Civil Protection", 2015
- 2nd Environmental Conference of Thessaly, 2015
- The International Conference "The 1755 Earthquake - Lisbon Resilient", 2015
- Working Group of WG9 "Seismic effects", 2016
- Hellenic Conference: "SafeEvros 2016: New Technologies for Civil Protection", 2016
- International Conference on Natural Hazards & Infrastructure (ICONHIC), 2016
- International Journal of Social, Behavioral, Educational, Economic, Business and Industrial Engineering, 2016
- 18th International Conference on Educational Sciences, 2016
- 18th International Conference on Special Needs Education, 2016
- European Exhibition of Creativity and Innovation, EUROINVENT, 2016
- 4th Hellenic Conference: "Crisis Management in the Health Sector", 2017
- 5th International Conference on Disaster Management and Human Health: Improving Outcomes, 2017
- International Conference: "SafeAthens 2017: New Technologies for Civil Protection", 2017
- 19th International Conference on Educational Sciences and Technology, 2017

PUBLICATIONS

1. Ioakeimidou. «Pre-earthquake evaluation of existing buildings and Post earthquake buildings inspection practices in Greece».
2. Kourou. «Comparative study on the preparedness level of the population of Greece»
3. Kourou. «E.P.P.O. & seismic risk management in the school community»
4. Kourou, A. Ioakeimidou. «Pre-primary Schools' Earthquake Safety Initiative in Greece».
5. Kourou, A. Ioakeimidou. «Seismic protection: Preparedness in the workplace»
6. Kourou, A. Ioakeimidou, E. Pelli, M. Panoutsopoulou, V. Abramea. «Disaster Preparedness for People with Disabilities through EPPO's Educational Awareness Initiative».
7. Kourou, A. Ioakeimidou, E. Bafa, C. Fassoulas, M.Panoutsopoulou (2016). «Volunteers' Preparedness for Natural Disasters and EVANDE Project».
8. Kourou, C. Fassoulas, M. Panoutsopoulou & A. Ioakeimidou. «The contribution of the EVANDE project to the preparedness improvement of civil protection officers and volunteers»

9. Kourou, A. Ioakeimidou, S. Hadjiefthymiades, V.Abramea. «Earthquake Preparedness of School Community and E-PreS Project».
10. Kourou, A. Ioakeimidou, V. Avramea. «School Emergency Drills Evaluation through E-PreS Monitoring System».
11. Ioakeimidou. «Participation of Greece in the Technical Experts Mission of the EU Civil Protection Mechanism to the affected areas of Italy from the 24/8/2016 earthquake»
12. Kontogiannis, I. Karatzanis, D. Manousos, P. Argyropaidas & C. Gountromichou. «Innovative ICT services for emergency shelter camp management - PACES Project»
13. Gountromichou, M. Manoussaki, N. Karveleas & M. Gorgoulis. « Earthquake operational preparedness assessment – the Case study of Crete Island»
14. Gountromichou, M. Manoussaki, T. Thoma, D. Kazantzidou - Firtinidou, N. Kyriakides. «Seismic Risk Perception and Communication»
15. G. Zagora. «Post-Earthquake phase: Inspection and restoration of buildings. Comparative study of Andravida and L'Aquila earthquakes».
16. G. Zagora, S. Hamilton. «Hurricane Katrina: What went wrong »
17. Kazantzidou – Firtinidou, C. Gountromichou, N. Kyriakides, P. Liassides, & K. Hadjigeorgiou. «Seismic Risk Assessment as a basic tool for Emergency Planning – "PACES" EU Project
18. E.Pelli & A. I. Sofianos. «Calculation of the Stress Field around Tunnels due to incident S-Waves».
19. E.Pelli & A. I. Sofianos. «Complex Function Method for the calculation of the Stress Field around tunnels due to incident S - Waves».
20. E.Pelli & E.Vougioukas. «Vulnerability issues of lifelines against earthquake induced ground motions»
21. E.Pelli, D.Panagiotopoulou, E.Vougioukas, D. Tsafou & S.Stamatiou. «Seismic Vulnerability of Public Buildings in Greece: a First Approach of the Rapid Assessment Control»
22. Hadjiefthymiades S., Paskalis S., Loukeris M., Chatzidakis M., Kourou A., Ioakimidou A., Abramea V., Craifaleanu I., Georgescu E., Dragomir C., Dobre D., Meita V., Sandu M., Cismelaru A., Tzvetanski T., Tzvetkov P., Tsvetkov Y., Mihailova B., Sansivero F., Nave R., Fassoulas C., Klairi G., Kardaki L., Stathi I. «Monitoring and Evaluation of
23. Natural Hazard Preparedness at School Environment: the E-PreS Project»
24. K. Stylianidis, A. Sextos, M. Panoutsopoulou, D. Panagiotopoulou & K. Tarnava. «First degree pre–earthquake Inspection of Buildings for Public Use»
25. M. Dandoulaki & C. Gountromichou. «Mitigating disaster risk and humanitarian aid: Segregated or converging policy and management areas? »
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Seismological Laboratory (UPSL)
University of Patras

Introduction

The University of Patras, Seismological Laboratory (UPSL, http://seismo.geology.upatras.gr), was established in 1990 and it is part of the Department of Geology, Sector of Applied Geology and Geophysics. UPSL is monitoring the seismicity in Western Greece for almost twenty year. UPSL is one of the founding members of the Hellenic Unified Seismic Network (HUSN). The permanent seismic network (PSLNET) is UPSL's main infrastructure and comprises, broad band, strong motion and GPS stations. Data transmission to the acquisition servers is done in real time, using either mobile data telemetry or internet. Furthermore, UPSL has a large number of portable seismographs used for seismicity monitoring. Facilities include also, geophysical prospecting instruments and a computer center.

UPSL has served as partner or coordinator in various European projects. As a partner of the Hellenic Unified Seismic Network, UPSL is responsible for seismicity monitoring in western Greece thus a lot of effort is devoted in station maintenance. Seismic data of UPSL are available through the Greek EIDA node, located at the National Observatory of Athens. UPSL is a partner of the Corinth Rift Laboratory, which is an EPOS Near Fault Observatory targeting at the study of seismogenesis, at Corinth Gulf. Finally, UPSL is involved in teaching Seismology and Geophysics lectures at the Geology and Physics Departments of the University of Patras.

The main research fields of UPSL are:

- Seismic Tomography
- Earthquake source studies
- Seismic Hazard
- Local site conditions
- Seismotectonics
- Seismic networks – Seismicity monitoring

Main activities 2015-2018

During the last four years UPSL's activities were focused in maintenance of seismic stations and study of strong events in western Greece. A major reorganization of PSLNET was executed by adding new stations, moving/closing stations and changing the telemetry equipment from satellite to mobile data transmission.

Furthermore, UPSL continued monitoring the seismicity in the area i.e. locating events, calculating moment tensors for M~>4 and reporting the results to EMSC, local agencies, media etc.

During 2018 the Hellenic Plate Observing System (HELPOS) project was launched. This is a major national infrastructure project, and during this an upgrade of PSLNET is planned. Already the purchase of four broad band sensors and six recorders is on the way, together with additional equipment, installation of

new stations, vault reconstruction etc. HELPOS will enhance the data sharing and data availability for HUSN stations among other goals.
In November 17, 2015 a strong earthquake (Mw6.4) occurred at the island of Lefkada causing two deaths and significant damages/landslides, mainly at the southern part of the island. A temporary seismic network was installed soon after the event. Its scope was the monitoring of the aftershock sequence. Six short period stations were installed one day after the event (18th of November 2015) and the stations were uninstalled a few months later (April 2016). Data were recorded in miniseed format and are available to the scientific community through the Greek EIDA node hosted at the National Observatory of Athens (http://eida.gein.noa.gr/).
UPSL was involved in a few research projects during the last four years, funded by either National or European resources. Projects were mainly focused in seismic monitoring and seismic hazard studies.

Cooperation

UPSL has strong cooperation with many institutes or research groups (a not all-inclusive list follows):

- Charles University in Prague, Faculty of Mathematics and Physics, Czech Republic
- Institut de Physique du Globe de Paris, France
- Ecole Normale Supérieure, Laboratoire de Géologie, France
- National Observatory of Athens, Geodynamics Institute, Athens
- Department of Geophysics, Aristotle University of Thessaloniki

Other activities

Besides its scientific activities in many research fields, UPSL is also involved in promoting seismic awareness in elementary and high schools. This is accomplished through presentations done by Lab's personnel and using educational seismographs in schools. Moreover, the lab's personnel are involved as scientific advisors in school projects, dedicated to earthquake study and enhancement of seismic awareness.

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