International Union of Geodesy and Geophysics

Grants Program

Technical Report

Project title: Partnership Conference "Geophysical observatories, multifunctional GIS and data mining" 30 September – 3 October 2013, Kaluga, Russia.

(Initial title in the application form: International Workshop "Extension of INTERMAGNET Russian Segment: Prospects and Challenges", Russia, October-November 2013).

Requested amount: 18,000$

Applicants:

Lead applicant: International Association of Geomagnetism and Aeronomy (IAGA)
Supporting applicants: IUGG National Geophysical Committee of Russia (NGC); International Association of Geodesy (IAG); Union Commission on Data and Information (UCDI).

Project Principal Participants:

Program Committee:
Chair*: Gvishiani Alexei*, Full member of RAS, Director, Geophysical Center, RAS; Chair of National Geophysical Committee, RAS; Deputy Chair of Committee on System Analysis, RAS.
Co-chairs:
Kryazhimskiy Arkady, Full member of RAS, Steklov Mathematical Institute, RAS; International Institute for Applied Systems Analysis.
Chulliat Arnaud, Director of magnetic observatories, Paris Institute of Physics of the Earth, France.

Members of Program Committee:
Anisimov Sergey, "Borok" Geophysical Observatory, Schmidt Institute of Physics of the Earth, RAS;
Fedonkin Mikhail, Full member of RAS, Geological Institute, RAS;
Finn Carol, United States Geological Survey, USA;
Gliko Alexander, Full member of RAS, Head of Earth Sciences Division of RAS;
Hegymegi Laszlo, MinGeo Ltd., Hungary;
Ismail-Zadeh Alik, International Union of Geodesy and Geophysics; Karlsruhe Institute of Technology, Germany/Russia;
Jaupart Claude, Paris Institute of Physics of the Earth, France;
Kaban Mikhail, GFZ German Research Center for Geosciences, Germany;
Kabat Pavel, International Institute for Applied Systems Analysis, Austria;
Kaftan Vladimir, Geophysical Center, RAS;
Kuznetsov Vladimir, Pushkov Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation, RAS;
Lapshin Vladimir, Federal State Budgetary Institution "Fedorov Institute of Applied Geophysics", Roshydromet;
Lemke Peter, Alfred Wegener Institute, Helmholtz Center for Polar and Marine Research, Germany;

Linthe Hans-Joachim, Helmholtz Center Potsdam, GFZ German Research Center for Geosciences, Germany;
Lushnikov Alexey, Geophysical Center, RAS;
Matzka Jurgen, National Space Institute of Technical University of Denmark;
Pokhotelov Oleg, Schmidt Institute of Physics of the Earth, RAS;
Rovenskaya Elena, International Institute for Applied Systems Analysis, Austria;
Saari Donald, Institute for Mathematical Behavioral Sciences, USA;
Soloviev Alexander, Corresponding member of RAS, Institute of Earthquake Prediction Theory and Mathematical Geophysics, RAS;
Soloviev Anatoly, Geophysical Center, RAS;
Starostenko Vitaly, Full member of NAS of Ukraine, Institute of Geophysics, NAS of Ukraine;
Sumaruk Yuri, Institute of Geophysics, NAS of Ukraine;
Vaisberg Leonid, Mechanobr-Tekhnika Research and Engineering Corporation, Russia.

Organizing Committee:
Chair: *Rybkina Alena*, Geophysical Center, RAS.
Co-chair: *Krasnoperov Roman*, National Geophysical Committee, RAS.

Members of Organizing Committee:
Drinkovic Sanja, International Institute for Applied Systems Analysis, Austria;
Groudnev Andrey, Geophysical Center, RAS;
Nikiforov Oleg, Geophysical Center, RAS;
Odintsova Anastasia, Geophysical Center, RAS;
Pyatygina Olga, Geophysical Center, RAS;
Shibaeva Anna, Committee on System Analysis, RAS;
Titskaya Nina, Geophysical Center, RAS.

Priority area: Dissemination of Data and Information on Geophysics and Geodesy.

Project results:

From September, 30th till October, 2nd the Russian town of Kaluga hosted the international partnership conference “Geophysical observatories, multifunctional GIS and data mining”. This conference became the next stage in the collaboration of the partner organizations in different countries, which develop projects in the various fields of geoscience. The first partnership international workshop (“Artificial intelligence in the Earth’s magnetic field study. INTERMAGNET Russian Segment” Uglich, Russia, January, 26–28, 2011) formed the basis for several important projects in the area of geomagnetic studies and related fields of geophysics and geoinformatics in Russia. As a part of INTERMAGNET, the Russian-Ukrainian Geomagnetic Data Center (http://geomag.gcras.ru/) was launched at the Geophysical Center of the Russian Academy of Sciences (RAS) in 2012. Since 2011, several Russian magnetic stations have been officially approved as INTERMAGNET observatories. New observatories are being actively deployed in Russia. A new full-scale magnetic observatory was established in the Odessa region in Ukraine. Success of the Uglich workshop justified the enlargement of the scope of the Kaluga partnership conference.

The conference in Kaluga was organized under the auspices of UNESCO as a part of the Year for the Mathematics of Planet Earth and supported by the International Union of Geodesy and

Geophysics (IUGG) and International Association of Geomagnetism and Aeronomy (IAGA). The organizers of the conference: Geophysical Center of RAS; International Institute for Applied Systems Analysis (IIASA); Paris Institute of Physics of the Earth (IPGP); Schmidt Institute of Physics of the Earth of RAS; Committee on Systems Analysis of RAS; National Geophysical Committee of Russia; Federal Service for Hydrometeorology and Environmental Monitoring of Russia (Roshydromet); Fedorov Institute of Applied Geophysics of Roshydromet; Committee on Data for Science and Technology (CODATA); Russian Foundation for Basic Research.

The conference united more than 120 leading scientists and data experts in geophysics, geoinformatics, environmental sciences, applied and advanced system analysis, and artificial intelligence from Austria, Canada, Czech Republic, Finland, France, Germany, Hungary, Russia, Switzerland, Ukraine, and the USA.

One of the important objectives of the Kaluga conference was sharing knowledge, data and experience among partner organizations from different countries, which collaborate in the above mentioned areas of research. Expansion of the magnetic observatory network on the territories of Russia and Ukraine will help establish a corresponding segment of INTERMAGNET with a sufficiently uniform coverage. It will provide the world scientific community with data, required for more precise modeling of the geomagnetic field and recognition of the magnetic activity.

The conference program included the following scientific sessions and panel discussions:

- Geophysical observation systems and data mining.
- High quality observations of the Earth's magnetic field.
- Multifunctional intellectual methods for geophysical, ecological, socio-economic and biomedical research.
- Advanced system analysis, data mining and artificial intelligence in processing time series from geomagnetic, geophysical, ecological, socioeconomic and biomedical observations.
- Geology, geophysics and geoinformatics of the Arctic region: multifunctional observatories and intelligent GIS.

At the session, devoted to geophysical observations, the leading scientists in the field discussed such pivotal issues as advances in geophysical measurement techniques, collection and analysis of geophysical data, geophysical modeling, solar-terrestrial coupling, and space weather. During the panel discussion the current problems and prospects of geophysical monitoring in Russia were discussed. The Session also touched upon the implementation of satellite data (GNSS, ACE) in geophysical studies. Another key focus of the session was data mining in geophysical and other geoscience data using modeling and geoinformatic techniques.

The session, dedicated to observations of the Earth's magnetic field, focused on the progress and achievements in the field of geomagnetic studies, ground and space geomagnetic observation systems, including expected results of the SWARM satellite project, and relevant data mining problems. Special emphasis was given to the development of INTERMAGNET magnetic network in Russia and Ukraine. Recent achievements in deployment of new observatories were presented. Since the essential element of any observation network is a data collection center, thus, various aspects of geomagnetic data transmission, handling and dissemination were discussed. One of the

keynote reports was dedicated to the development of the Russian-Ukrainian center for geomagnetic data retrieval and exchange.

Other key topics of the panel discussions included intelligent geoinformation systems and technologies (IGIS) and modern mathematical methods. The panelists focused on applications of these techniques to geophysical, geological, socioeconomic and biomedical data and models. Principal tasks of geoinformatics include development of geoinformation environment and methods of artificial intelligence for data mining. Their integration enables creation of multifunctional integrated geoinformation systems for various purposes. Participants discussed the problems of integration of geoscientific, environmental, biomedical and socio-economic data within a complex multifunctional intelligent GIS, provided with a wide range of algorithms for object orientated analysis. Such IGIS is a sophisticated instrument for decision-making support in poverty mitigation, food and water problems, ecology improvement and world overpopulation. These problems are the three key research themes of IIASA, and the conference also focused the attention of participants on the opportunities of joint projects within IIASA's research programs.

The session, devoted to Arctic research, focused on the present status and future deployment of Earth sciences observations in this region. Panelists gave a brief outlook of the current problems which accompany exploration and development of the Arctic region including the vital problem of oil and gas prospecting and exploitation. International collaboration, especially between the countries that have boarders with the Arctic Ocean is extremely important. At this point the main ideas of the Arctic project of IIASA were presented.

The scientific program of the conference included a business-meeting dedicated to the development of the Russian-Ukrainian INTERMAGNET segment. The main objective of this meeting was the discussion of the current status and future plans for the geomagnetic observatory network on the territory of Russia and Ukraine. Among the discussed problems were the following important items:

- Progress in development of the Russian-Ukrainian INTERMAGNET segment since the previous meeting in Uglich in 2011.
- Activities of the Russian-Ukrainian Geomagnetic Data Center (geomag.gcras.ru).
- Possibilities of real-time data transmission from geomagnetic observatories in Russia.
- Deployment of new observatories of INTERMAGNET standard in Russia.

This conference promoted new business and personal connections among leading scientists and specialists in geophysics, geoinformatics, geomagnetism and geomagnetic measurements, environmental sciences, applied and advanced system analysis, and artificial intelligence from all over the world. The conference summed up the results and outlined new ways of development of projects in the field of study of the Earth's magnetic field and practical application of results of this study.

Financial Report on the

International partnership conference

“Geophysical observatories, multifunctional GIS and data mining”

30 September – 3 October 2013, Kaluga, Russia.

Name	*Amount (in euro)*
1. Expenses on travel and arrangements of the participants of the conference	8,450
2. Expenses on preparation and running the conference	1,600
3. Conference website development	1,950
Total:	**12,000**