



ROMANIAN ACADEMY

Mathematical Sciences Department

**Astronomical Institute of
the Romanian Academy**

Geonomic Sciences Department

**"Sabba S. Ștefănescu" Institute of Geodynamics
of the Romanian Academy**

Geo-sciences Day

Bucharest, Romania

May 31, 2019

Welcome and Opening
The Aula of the Romanian Academy
(Calea Victoriei 125, 010071, Bucharest, Romania)
9.00-9.30

Part I
The Aula of the Romanian Academy
(Calea Victoriei 125, 010071, Bucharest, Romania)
9.30-14.00

1. Professor, Dr. Mioara Mandea (French Space Agency, Paris, France): " News from the deep Earth's interior from the satellite data "; **9.30-10.00**

Abstract: We have long appreciated that magnetic measurements obtained on and about our planet are of great value in probing the deep interior. These observations are useful, and together with gravity ones, may infer the state of the Earth's interior and its evolution. Recently, it has become clear that models of the magnetic and gravity fields, over more than a decade have reached an unprecedented resolution and accuracy, allowing to gain insight into the core-mantle boundary phenomena and the core dynamics. Here, results based on more than a decade of data provided, on one hand by CHAMP and Swarm missions, and on the other hand by GRACE mission are presented. Over the period from January 2003 to December 2015, covered by both magnetic and gravity data, "virtual magnetic and gravity observatories" (VMGOs) have been built, with a temporal window of a month. Correlations between the VMGOs series have been computed and correlated temporal variations between gravity and magnetism over large areas have been found. These correlations are linked with the core-mantle interaction and core flows.

2. Academician, Nicolae Panin (Romanian Academy, panin@geoecomar.ro): " River - sea systems, elements of the Earth 's structure and factors of environmental equilibrium"; **10.00-10.30**

Abstract: River-sea systems are extremely complex and fragile. Their components interact closely with each other - such a system is, in fact, a continuum and represents the link between the so-called continental and the marine hydrospheres. River - Sea systems are at the same time the interface and the area of specific interactions between the different elements of our planet structure - the atmosphere, the hydrosphere, the lithosphere, the biosphere, etc. In many cases certain natural factors, but especially human activities, lead to the fragmentation of the river continuum and to the change of its equilibrium - and hence of the environmental equilibrium of the respective region. River - Sea systems also have great geopolitical, economic, social and environmental importance. River, delta / estuary and marine ecosystems have multiple functions in preserving environmental quality and biodiversity. They play, especially when they are of considerable size, an important role in maintaining the natural balance and even in controlling in certain measure the climate changes on a regional/continental scale. Among the river systems of the European Union, the Danube - Black Sea system is the largest and is of prime importance for the EU and especially for Romania. The main features of the Danube River - Danube Delta - Black Sea system are described. Finally, the DANUBIUS-RI Strategic Project of National Importance is shortly presented. The project aims at creating a pan-European distributed research infrastructure for in-depth knowledge of river-sea systems for their sustainable, scientific management.

3. Professor, Dr. Liviu Mațenco (Department of Earth Sciences, Utrecht University, The Netherlands, L.C.Matenco@uu.nl): "Coupling tectonics and sedimentary fluxes: science and social impact in Romania and neighbouring Central Europe"; **10.30-11.00**

Abstract: Understanding the relationship between tectonics and sedimentary fluxes is critical for developing a strong scientific basis for an integrated management plan of natural hazards. The Carpathians - Pannonian - Dinarides system is one of the most active tectonic places in continental Europe, where deformation is associated with large changes in sedimentation and a rapid migration of topographic features that have significant impact not only in earthquakes, landslides and flooding events, but induce active changes in the river network with significant societal and economic impact. The contribution is focussed on understanding and quantifying processes that control the relationship between tectonics and sediment fluxes with relevant impact in Central Europe.

4. Senior Researcher I, Dr. Carmen Ortansa Cioflan (National Institute for Earth Physics, Măgurele, România, cioflan@infp.ro): "From seismic hazard to seismic risk"; **11.00-11.30**

Abstract: Seismic hazard and risk are different concepts while their evaluation is interconnected: the main challenge in risk estimation lies in the appropriate description of seismic hazard, i.e. the seismic ground motion level expected at a certain location or region within a certain time interval. The presentation is a comparative review of the methods currently used for estimating seismic hazard, highlighting the common points, their specific ways for incorporating and treating uncertainties and interpretation of their results. Examples are given from modern analyses of the seismic hazard at national and European scale. Further on, the concept of seismic risk is presented, it's evolution and aspects derived from the practice are discussed. Results of risk analysis are found to be sensitive to the ones provided as an input by the seismic hazard analyses. Hence, it is worthwhile to review the methodologies of seismic hazard analyses and to emphasize the need of objective testing of their results. Examples are given from the recently completed project "Evaluation of disaster risks at national level (RO-RISK)" where the seismic risk has been evaluated in line with the newly adopted methodology. In practice, the knowledge of the seismic risk is essential for earthquake preparedness, management of the emergency situation(s) and development of a resilient society.

11.30 – 12.00 Coffee break

5. Directeur de Recherche, Dr. Răzvan Caracas (Centre National de la Recherche Scientifique, Laboratoire de Géologie de Lyon, Lyon, France, razvan.caracas@ens-lyon.fr and Centre for Earth Evolution and Dynamics, University of Oslo, Norway, razvan.caracas@geo.uio.no): "The Giant Impact that produced the Earth and the Moon"; **12.00-12.30**

Abstract: The beginning of the solar system was marked by many impacts powerful enough to make and un-make proto-planets, planetesimal and moons. The Earth did not escape this either; the last gigantic impact was large enough provoke a total breakdown of the original bodies and to transform the proto-Earth and the impactor in a huge disk of gas and lava. Large parts of it were probably supercritical, a special state of matter at high temperatures, where the distinction between gas and liquid disappears. This most probably happened in the first 100 million years after the beginning of the solar system. The Earth and the Moon that we know today have condensed from this protolunar disk. As actual experiments are very difficult under these high temperature and low pressure conditions, in the Lyon group we have chosen an alternative: we are doing numerical experiments. We use atomistic computational techniques derived from quantum mechanics to study the interaction between atoms and molecules. Thus we can determine not only the temperatures and pressures from which this supercritical state exists, but also characterize its physical and

chemical properties. As such we are able to model the chemical reactions taking place in the protolunar disk, the condensation of the gaseous portion, the isotope partitioning, and the volatiles loss in order to finally reconstruct the thermodynamic path of the Earth and Moon condensation in this protolunar disk.

6. Professor, Dr. (emeritus) Sabina Ștefan (Faculty of Physics, University of Bucharest, Romania, sabina.stefan@fizica.unibuc.ro): "Effects of radiative forcing due to atmospheric aerosols on Climate System's radiation budget"; **12.30-13.00**

Abstract: The aerosol particles (aerosols) come from natural and anthropogenic sources and represent a key piece in the Climatic System because they can increase the cooling or warming of the Earth surface, through their interactions with solar radiation and clouds. The aerosols directly attenuate the surface solar radiation (SSR), absorbing and scattering solar radiation in the atmosphere and indirectly acting as cloud condensation nuclei, thereby changing cloud reflectivity and lifetime. The effect of aerosols on climate is quantified in terms of radiative forcing, defined as the net radiative flux change at the top of the atmosphere (TOA) and also at surface, due to aerosols changes over time. Quantification of this forcing is fraught with uncertainties. The aim of this work was to estimate the direct radiative forcing (DRF) and the uncertainties from aerosol- radiation interactions, using remote sensing observations and in situ measurements of fine-mode aerosol properties. The analysis started from local to regional and from daily to seasonal temporal variations.

7. Professor, Dr. Mirel Bîrlan (Institut de Mecanique Celeste et des Calculs des Ephemerides, Observatoire de Paris, PSL Research University, Paris, France, mirel.birlan@obspm.fr): "Observing and modeling asteroids: morphology and internal structure"; **13.00 – 13.30**

Abstract: There are more than 790,000 small bodies into our Solar System; most of them are also commonly named asteroids. Asteroids are essential in deciphering the Solar System history and evolution. Due to their large number, they are a natural scale laboratory, a tracer for the evolution of planetary system during the 4.5 billion of years since the accretion process start forming the protoplanets. Space missions observations together with the one obtained from the ground are on the basis of milestones of the history and evolution of small bodies. Tremendous degree of precision in the measurements allows complex analysis of their mineralogy, internal structure, and their morphology and geology. This presentation will be oriented toward new achievements obtained using "in situ" spacecraft observations thanks to onboard instruments of Rosetta, Near-Shoemaker, Dawn, Hayabusa-1 & 2, and OSIRIS-REx. These data will be highlighted also by new groundbased observations using the new generation instrument Sphere, installed on Very Large Telescope.

8. Senior Researcher I, Dr. Octavian Mihai Bădescu (Astronomical Institute of the Romanian Academy, Bucharest, Romania, tavi_badescu@yahoo.com): "Astro-geodetic determinations for geoid modeling and validation". **13.30 – 14.00**

Abstract: Geoid determination as physical figure of the Earth and reference equipotential surface represents one of the major tasks of geodesy. Geoid knowing is important not for only Earth observation and science, but today it is also indispensable for the maintenance of many activities in a modern society. Regionally or globally geoid determination is a problem of equal scientific and practical interest. Despite of the difficulty in obtaining, one of the most valuable quantity used for geoid determination or geoid modelling is the astro-

geodetic (Helmert) vertical deviation. The combination between the satellite global models augmented by local and regional data from terrestrial measurements is the suitable solution for obtaining a high resolution geoid. Terrestrial methods as the astro-geodetic one are able to detect short wavelength structures of the geoid beside gravimetric, GNSS and leveling methods. All these terrestrial methods have both advantages and disadvantages, general rules being their common use. The presentation reviews several results achieved in this project of technological development regarding a procedure for astro-geodetic (Helmert) vertical deviation determination, where by procedure we understand the binomial formed by the instrument (measuring platform) plus the related methodology to use the instrument for measurements.

14.00-15.00 Lunch
(inside of the Romanian Academy)

Part II
The Aula of the Romanian Academy
(Calea Victoriei 125, 010071, Bucharest, Romania)

1. Senior Researcher II, Dr. Venera Dobrică ("Sabba S. Ștefănescu" Institute of Geodynamics of the Romanian Academy, Bucharest, Romania, venera@geodin.ro): "Geomagnetic storms and their associated geomagnetically induced currents – a space weather hazard"; **15.00-15.30**

Abstract: Large geomagnetic storms represent a significant space weather hazard through ground and near-Earth impacts. Coupling via processes in the magnetosphere and ionosphere, space weather drives changes throughout the ionosphere and in structures on the Earth's surface. The geomagnetically induced currents (GICs) hazard is one of the better recognised examples of space weather. In this presentation certain geomagnetic storms are analysed from the perspective of (1) solar source – solar wind – geomagnetic storm chain and (2) the induced hazardous response as shown by the surface electric field, the geophysical input in assessing ground space weather impact of GICs. The surface electric field over Europe produced by the variable magnetic field of geomagnetic storms is determined, based on the geomagnetic field recordings from European geomagnetic observatories and on information regarding the underground electric conductivity.

2. Senior Researcher I, Dr. Mihaela Popa (The National Institute for Earth Physics, Măgurele, Romania, mihaela@infp.ro): "Romania - seismic monitoring node in South-Eastern Europe"; **15.30-16.00**

Abstract: The seismic network designed to monitor the Romania territory and the border areas has experienced an impetuous development in the last years. It is currently one of the best performing seismic networks in Europe. Considering the major impact of the earthquakes occurred in the Vrancea source over an extensive area in the South-Eastern Europe, the National Institute for Earth Physics (NIEP) coordinated and participated in a series of European initiatives and programs focused on the implementation of an integrated system for monitoring and processing of seismic, geodetic and infrasonic data recorded in Romania and neighbouring countries: EPOS, Marine Geohazard, NERA, SAFER, DACEA, SHARE, SERA, ASTARTE, ARISTOTLE, TOPO-TRANSYLVANIA. At the same time, through NIEP, Romania has actively participated in the process of integration of the Earth movement monitoring infrastructures and of the procedures for data. As a recognition of the role played in this process, NIEP became in 2016 the European Integrated Data Archive (EIDA) for East Europe, providing real-time data and services to the neighbouring countries. The presentation reviews the results achieved in recent years and the role played by NIEP as a seismic monitoring node in South-East Europe.

3. Senior Researcher I, Dr. Marian Munteanu (Geological Institute of Romania, Bucharest, Romania, marianmunteanu2000@gmail.com): "Metal recovery from magmatic deposits of iron and associated metals: mineralogical, geochemical and technological influences"; **16.00-16.30**

Abstract: The magmatic iron deposits also contain metals such as titanium and vanadium. Such a composition can increase the value of the ore (when vanadium grade is high) but can pose technological difficulties, as well (when titanium grade is high). If the titanium minerals cannot be separated through beneficiation methods, special technology is necessary for iron extraction from the ore. The variability of vanadium grade induces varied extraction methods and different approaches towards the ore: what is considered ore in one mine can be considered waste in other mine. The presentation contains examples from South Africa and China.

4. Senior Researcher I, Dr. Ioan Seghedi ("Sabba S. Ștefănescu" Institute of Geodynamics of the Romanian Academy, Bucharest, Romania, seghedi@geodin.ro): "Ciomadul volcano, the youngest volcano of the Carpathian-Pannonian Region – results of the former studies and the present knowledge based on the new results "; **16.30-17.00**

Abstract: Ciomadul is the youngest volcanic system in the Carpathian-Pannonian Region recording eruptive activity from ca. 1Ma to 30 ka. Its modern study started in the 80s of the last century with the first volcanological map. Since then and especially in the recent years, there are a lot of interests for studying this volcano by using various methodologies: geophysical, geographical, geomorphological, geochronological, petrological, tephrological, geochemical (mineral waters, gases and hard rocks), etc. One of the reasons of studying this volcano is the capability of Ciomadul to erupt again in the near future taking into account the proofs of the existence of a melt-bearing subvolcanic magmatic system. This presentation will give an overview of all the important results accomplished until recently by a huge number of researchers.

5. Senior Researcher III, Dr. Diana Beșliu-Ionescu (Astronomical Institute of the Romanian Academy, Bucharest, Romania, diana.ionescu@astro.ro): "Geoeffective solar phenomena"; **17.00-17.30**

Abstract: The solar wind is the main driver of the space weather. It is influenced by the solar eruptive phenomena such as solar flares, coronal mass ejections, filament eruptions or solar energetic particles events. We will describe the solar events detected on March 15, 2015 using both real satellite data, as well as theoretical models to predict their impact on Earth. We will present the differences between the theoretical estimations and the real observations.

Part III
Astronomical Institute of the Romanian Academy
(*Cușitul de Argint Street, no 5, sector 4, 040557, Bucharest, Romania, <http://www.astro.ro>*).

Geosciences Café **18.30-20.30**

The Organizing Committee:

Prof. Dr. Mioara Manda (French Space Agency, European Geosciences Union);
Researcher I Crișan Demetrescu ("Sabbas Ștefănescu" Institute of Geodynamics of the Romanian Academy);
Researcher II Venera Dobrică ("Sabbas Ștefănescu" Institute of Geodynamics of the Romanian Academy);
Researcher III Diana Beșliu-Ionescu (Astronomical Institute of the Romanian Academy);
Researcher I Octavian Mihai Bădescu (Astronomical Institute of the Romanian Academy).

The access to Geosciences Day will be granted by invitation only.