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<http://bncgg.oma.be>

Annual report 2009 of the
BELGIAN NATIONAL COMMITTEE FOR GEODESY AND GEOPHYSICS
COMITE NATIONAL BELGE DE GEODESIE ET DE GÉOPHYSIQUE
BELGISCH NATIONAAL COMITE VOOR GEODESIE EN GÉOFYSICA

1. Short introduction on the subject of research and the goals of the Committee

Belgium was among the 9 countries who established the International Union of Geodesy and Geophysics ([IUGG](#)) on July 28, 1919 in Brussels. The Belgian National Committee for Geodesy and Geophysics (BNCGG) was created shortly after in 1921. The running expenses were covered until 1950 by the National Cartographic Institute and later on by Royal Academy of Belgium, now split into "[Koninklijke Vlaamse Academie van België voor Wetenschappen en Kunsten](#)" and "[Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique](#)".

The BNCGG serves as a link between [IUGG](#) and the Belgian scientists working in the fields of Geodesy and Geophysics. This activity reaches a climax every four years at the [IUGG](#) general assemblies. The BNCGG is charged to propose to the Academy the national representatives to [IUGG](#) and to its eight Associations, as well as to designate the national delegates to the IUGG and Association assemblies:

International Association of Cryospheric Sciences ([IACS](#));
International Association of Geodesy ([IAG](#));
International Association of Geomagnetism and Aeronomy ([IAGA](#));
International Association of Meteorology and Atmospheric Sciences ([IAMAS](#));
International Association of Hydrological Sciences ([IAHS](#));
International Association of the Physical Sciences of the Ocean ([IAPSO](#));
International Association of Seismology and Physics of the Earth Interior ([IASPEI](#));
International Association of Volcanology and Chemistry of the Earth Interior ([IAVCEI](#)).

The BNCGG regularly organises conferences by well-known Belgian or foreign scientists with the aim to promote interdisciplinarity and a system-oriented approach to the Earth sciences.

The BNCGG also tries to encourage the participation of young scientists to the [IUGG and Association General Assemblies](#) by attributing grants.

In parallel with the BNCGG there exists since 1955 an "Association sans buts lucratifs de droit belge" called "Comité National Belge de Géodésie et de Géophysique", with its official seat at Brussels. It administers the finances of the Committee.

2. Member list

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3. Meetings of the Committee in 2009

- dates and main conclusions

During 2009, the BNCGG held one General Assembly (22.01.2009) and two other meetings (27.04.09 and 18.06.09) with several talks.

The following talks were given to the Committee:

22.01.09

At 15h00 Prof. Eric Deleersnijder (UCL) presented a talk in English entitled:

"The unreasonable effectiveness of dimension reduction in complex geophysical flow modelling : How to reduce the number of degrees of freedom of a complex model by a factor of 1000 or more."

Summary:

Nowadays complex numerical models produce so huge an amount of real numbers that making sense of them, i.e. producing verbal interpretations of them, has become a challenging task. Post-processing methods are needed that reduce the amount of information to be submitted to the human being in charge of interpreting model results. In this respect, dimension reduction is an approach that is worth considering. No theoretical developments about dimension reduction methods will be presented. Instead, four applications will be dealt with, which are all concerned with tracer transport in the sea. First, the Mururoa Atoll lagoon is reduced to a well-mixed box. The lagoon-averaged tracer concentration of this one-variable model compares very well with that of a complex, 3D model encompassing tens of thousands of variables. A somewhat similar approach is applied to the Prince William Sound, Alaska; in this case, a box and a pipe are seen to be necessary. Then, the ventilation of the World Ocean is idealised by a leaky funnel model, i.e. a semi-infinite pipe with porous walls, whose section is variable. Finally, the timescale to tracer equilibrium in the World Ocean is tackled with a complex model that can be idealised as a three-box model, yielding indications of importance for paleoclimate studies. These examples illustrate the usefulness of dimension reduction as a tool for interpreting the results of complex models. That this tool is efficient is essentially due to the fact that the parameters of reduced-dimension models have a clear physical meaning.

24.07.09

At 14h00 Mr. Clovis Jacinto de Matos (ESA), presented a talk in English entitled:

"Scientific Research and Global Navigation Satellite Systems."

Summary:

Several Global Navigation Satellite Systems (GNSS) are presently in operation such as, for example, the American GPS and the Russian GLONASS.

In the near future the European Galileo system will complement these already existing constellations. Although the main applications of these systems are currently essentially civilian and military, they can also be used, to different extents, to carry out scientific research in a wide variety of domains such as, for example: Earth sciences (geodesy, geophysics, oceanography, meteorology, space-weather), metrology (measurement and global distribution of time and frequency), and fundamental physics (verification and utilization of the fundamental laws of quantum and relativistic mechanics in the framework of the satellite constellation). Thus, GNSS can be seen as providing a new, genuine, multi-disciplinary scientific application to different scientific communities and will most probably benefit from these communities with respect to its future evolution.

After the coffee-break, the meeting continued at 15h45 with Dr. Thierry Camelbeek (ROB) who presented a talk in English entitled:

"The earthquake activity in central Belgium since July 2008."

Summary:

Since 12 July 2008, a seismic sequence started in the region of Ottignies – Court-Saint-Etienne some 20 km to the southeast of Brussels. The most important earthquake occurred on July 13 and had a magnitude $M_L = 3.2$. Up to March 2009, 120 earthquakes have been recorded with magnitude as low as 0.

Surprisingly, even earthquake of magnitude smaller than $M_L = 1.0$, not necessarily recorded by the Belgian monitoring permanent network, have been observed despite the fact that their focal depth, well-constrained by a mobile seismic network, is around 5 km.

We present a preliminary analysis of the numerous collected data and observations. We will interpret them in the framework of the seismotectonic model of stable continental Europe. This seismic sequence demonstrates the difficulty to assess seismic hazard in these tectonically stable continental regions and the importance of conducting detailed specific studies of past earthquakes that occurred before the development of modern seismic networks.

18.06.2009

A meeting was organized in collaboration with the Solar-Terrestrial Center of Excellence in the form of a mini-symposium on the occasion of the visit of Prof. Eugene Parker, who discovered the solar wind.

14:05 Introduction to solar/stellar winds, J. Lemaire (BISA)

14:25 The kinetic structure of 1D and 2D magnetic discontinuities, M. Echim (BISA)

14:45 Stellar X-ray emission and spontaneous discontinuities in magnetic fields, E. Parker (U Chicago)

15:45 Coffee break

16:00 EUV imaging of the solar corona, D. Berghmans (ROB)

16:30 Large scale modeling of CMEs, G. Lapenta (KULeuven)

Prof. Eugene Parker from University of Chicago presented a talk in English entitled:

"Stellar X-ray emission and spontaneous discontinuities in magnetic fields."

Summary :

There is the curious fact that the X-ray corona of the Sun appears to be heated by the dissipation of the magnetic energy in a plasma so hot ($1 - 5 \times 10^6$ K) that there is very little resistivity. The X-ray corona would seem to be an unlikely place to find dissipation of magnetic field.

Note then that the photospheric footpoints of the re-entrant magnetic fields of the X-ray active regions are continually shuffled about by the photospheric convection, so that the field lines are randomly interlaced. This reduces the characteristic transverse scale of variation, of course, but not enough to accomplish significant resistive dissipation of the associated electric currents. It appears that the dissipation is accomplished through the remarkable properties of the magnetic equilibrium equation, taking the form in the simplest case of uniform plasma pressure. This equation has two families of complex characteristics and one family of real characteristic, viz. the field lines. In the presence of an interlaced field line topology an intrinsic part of the equilibrium field is the existence of surfaces of tangential discontinuity, i.e. current sheets lying along the field lines. In the relaxation to equilibrium the stresses in the magnetic field push the field gradients to concentrate into individual surfaces of discontinuity, thereby providing resistive dissipation of the magnetic free energy no matter how small the resistivity. We suggest that this effect is responsible for heating the X-ray corona of the Sun, and, by inference, the X-ray coronas of other late main sequence stars.

4. General Assemblies of the Scientific Union in 2009

- Dates

Inside the International Union of Geodesy and Geophysics ([IUGG](#)) there are seven associations (see Goals of CNBGG). For each of them, there is a National Representative who can vote for Belgium during the General Assembly of the Association.

- Johan De Keyser attended the IAGA 2009 scientific assembly (Sopron, Hungary, August 23-30, 2009) as Belgian delegate (<http://www.iaga2009sopron.hu/>).
- Carine Bruyninx attended the IAG 2009 scientific assembly (Buenos Aires, Argentina, August 31 – September 4, 2009) to replace the Belgian representative Véronique Dehant.
- Belgian delegates were also present at the joint IAMAS, IAPSO and IACS meeting (Montréal, Canada, July 19-29, 2009).

- Main conclusions

These assemblies settled some internal affairs, such as changes in the secretaries of the Associations (e.g. for IAGA), the designation of locations for future assemblies, a preview on the 2011 IUGG Assembly in Melbourne, ... Also, a number of formal statements or recommendations have been issued at these assemblies, in order to promote or endorse certain research and public outreach activities. Please refer to the websites of the Associations for specific details.

5. Other activities in 2009

- Description

The BNCGG sponsored the International Year of the Planet Earth with activities in Belgium from 2007-2009 (<http://we.vub.ac.be/~dglg/Web/IYPE/IntroIYPE.html>).

- Goal

The purpose of the *International Year of the Planet Earth* was to:

- Reduce risks for society caused by natural and human-induced hazards
- Reduce health problems by improving understanding of the medical aspects of Earth science
- Discover new natural resources and make them available in a sustainable manner
- Build safer structures and expand urban areas, utilizing natural subsurface conditions
- Determine the non-human factor in climatic change
- Enhance understanding of the occurrence of natural resources so as to contribute to efforts to reduce political tension
- Detect deep and poorly accessible groundwater resources
- Improve understanding of the evolution of life
- Increase interest in the Earth sciences in society at large
- Encourage more young people to study Earth science in university

- **Attendance**

Several activities (described on <http://we.vub.ac.be/~dglg/Web/IYPE/IntroIYPE.html>) were organized for the large public.

6. Future perspectives

- The XXV General Assembly of IUGG will be held on June 27 - July 8, 2011, in Melbourne, Australia (<http://www.iugg.org/assemblies/2011melbourne/>).