

Académie Royale de Belgique

Comité National Belge
de
GEODESIE et de GEOPHYSIQUE

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voor
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<http://bncgg.oma.be>

Annual report 2011 of the **COMITE NATIONAL BELGE DE GEODESIE ET DE GEOPHYSIQUE** **BELGISCH NATIONAAL COMITE VOOR GEODESIE EN GEOPHYSICA**

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

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 then charged to propose to the Academy the national delegates to [IUGG](#) and to its eight Associations:

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](#)).

In the mean time the BNCGG organises regularly conferences by known Belgian or foreign scientists.

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

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](#)".

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, Bruxelles". It is charged to administrate the finances of the Committee.

2. Member list

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3. Meetings of the Committee in 2011

- dates and main conclusions

During 2011, the CNBGG had one General Assembly (27.01.2011) and two other meetings (23.05.11 and 07.11.11) with several talks.

The following talks were given to the Comité:

27.01.11 at 15h00 : Dr. Romain Maggiolo, (Belgian Institute for Space Aeronomy) presented in English at the RMI a talk entitled:

Ionospheric outflow: influence of the Earth magnetic environment

One of the most remarkable features of the solar system is the variety of planetary atmospheres. Venus, Earth, and Mars are approximately at the same distance from the Sun. This means they formed out of the same material and had approximately the same initial temperatures. However, they have evolved differently. The atmosphere is now dense and hot on Venus, cold and tenuous on Mars and in-between on Earth. This is partly because the atmospheric erosion differs from one planet to another.

Among the mechanisms that control atmospheric erosion, the interaction between the solar wind -a flow of charged particles continuously emitted by the Sun- and the planetary ionospheres -the ionized portion of the upper atmosphere- is believed to play a significant role.

Contrary to Mars and Venus, the Earth has a strong magnetic field. It acts like a shield creating a bubble, the magnetosphere, which separates its ionosphere from the solar wind. However, this shielding is only partial. The magnetosphere is actually a complex and dynamic environment coupling the solar wind and the ionosphere via plasma and energy exchange.

After a brief introduction on atmospheric evolution, I'll go through the main mechanism that controls ionospheric outflow on unmagnetized (Venus and Mars) and magnetized planets (Earth). We'll see how the presence of a magnetosphere influences ionospheric particles escape on Earth and to what extent the Earth magnetic shield is protective.

23.05.11 at 13h00 : Pr. Michel Crucifix, du Georges Lemaître Centre for Earth and Climate Research de l'UCL, presented in English a talk entitled:

“Probabilities, Dynamical Systems, and Climate Sciences : how do we put this together?”

After the coffee-break, the meeting continued at 14h10 with Dr. Michel Van Camp (Département des Systèmes de référence et géodynamique, Royal Observatory of Belgium) who presented in English a talk entitled:

"An unexpected earthquake but an expected tsunami in Northern Honshu (Japan) on March 11, 2011."

On March 11, 2011, Japan was struck by a magnitude 9 earthquake, the 5th greatest on record since 1900. The Tohoku (or Sendai) earthquake violently shacked the northern part of Honshu and triggered one of the most destructive tsunami. We will describe the tectonic context, explain why such a magnitude 9 event was considered as unexpected, but also that, locally, such strong tsunamis have repeatedly been observed in the past. This megathrust earthquake is the first one to be extraordinarily well instrumented, Japan being the country operating the densest seismic and GPS networks. We will present some important results and report on the Earth's free oscillations observed in Belgium. Finally, we will also discuss what can be learned from the ongoing postseismic relaxation.

07-11-2011 at 14h00: **Dr. Gaetan Le Chat** (LESIA, Observatoire de Paris-Meudon)

Large-scale variation of the high latitude fast solar wind properties.

Since the first measurements of the solar wind in 1960, the properties of this plasma outflow from the Sun has been intensively studied, theoretically and by in situ measurements. However, some features still remain not understood, as the transport of the energy in collisionless plasmas like the solar wind. Measuring the temperature of the electrons and their nonthermal properties can give important clues to understand the transport properties. Quasi-thermal noise spectroscopy is a reliable tool for measuring accurately the electron density and temperature since it is less sensitive to the spacecraft perturbations than particle detectors.

This noise is produced by the quasi-thermal fluctuations of the particles and allow to measure the moments of their velocity distributions. We apply this method to Ulysses radio data obtained during the first pole-to-pole fast latitude scan in the high-speed solar wind, using a kappa function to describe the electron velocity distribution. We deduce the variations with heliocentric distance between 1.5 and 2.3 AU in the fast solar wind at high latitude in terms of three fitting parameters: the electron density varies as $n_e = 26.8 R^{(-1.96 \pm 0.08)}$, the electron temperature as $T_e = 2.3 R^{(-0.53 \pm 0.15)}$, and the kappa index of the distribution remains constant at $\kappa = 2.0 R^{(-0.02)}$. These observations agree with the predictions of the exospheric theory.

14:45-15h00 : Coffie Break

15h00-15h45 : Dr. Norma Crosby (BISA) :

Welcome to the World of Solar Energetic Particles

Solar energetic particles [SEPs] are charged particles (mainly protons, electrons, and α -particles with small admixtures of ^3He -nuclei and heavier ions up to iron) that follow the interplanetary magnetic field lines that are embedded in the solar wind. SEP events are sporadic and difficult to predict, lasting from minutes to days with energies from a dozen

keV to a few GeV. They are associated with solar flares and/or the shock waves generated by coronal mass ejections. SEP events are a serious radiation hazard for spacecraft as well as a severe health risk to humans travelling in space. Strong SEP events can also produce intense ionization in the D-region ionosphere over the polar caps; such polar cap absorption events can be devastating to radio communications. In summary, SEP events are of interest in regard to basic research (sources, acceleration, propagation), as well as from the practical side (the damage they may cause). This talk will present our current understanding of SEP events and how one can study them (individually or statistically). Various statistical and physical modeling techniques will be presented (e.g. ESA SEPTEM project, EU FP7 COMESSEP project).

4. General Assemblies of the Scientific Union in 2011

- **Dates**

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

The President of our committee Johan De Keyser attended the IUGG General Assembly as Belgian National Representative for the IUGG Council.

Resolutions adopted by the council can be found at <http://www.iugg.org/resolutions/>.

- He voted also for IAGA2011 (International Association of Geomagnetism and Aeronomy) scientific Assembly as Belgian delegate
- Prof. Philippe Huybrechts attended International Association of Cryospheric Sciences ([IACS2011](#)) scientific Assembly.
- Prof. Véronique Dehant attended International Association of Geodesy ([IAG2011](#)) as Belgian delegate

The other Belgian representative delegates were also present or provided a procuration to another delegate:

- Prof. Niko Verhoest was represented by Sander Vandenberghe for the International Association hydrological Sciences ([IAHS2011](#))
- Dr. De MAZIERE, Martine for the International Association of Meteorology and Atmospheric Sciences ([IAMAS2011](#)).
- Prof. Thierry Fichefet was represented for the International Association of the Physical Sciences of the Ocean ([IAPSO](#)).
- Prof. Thierry Camelbeeck was represented for the International Association of Seismology and Physics of the Earth Interior ([IASPEI](#)).
- Prof. Alain Bernard for the International Association of Volcanology and Chemistry of the Earth Interior ([IAVCEI](#)).

- **Main conclusions**

Inside the International Union of Geodesy and Geophysics ([IUGG](#)) there are seven associations (see Goals of CNBGG).

- For each of them, the National Representative can vote for Belgium during the General Assembly of the Association.

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- Each National Committee for Geodesy and Geophysics, which functions as a non-governmental entity in its relations with IUGG, is represented at General Assemblies of the Union by Delegates appointed by its Adhering Body. During these assemblies, policies governing the Union are agreed on, research programmes requiring international participation are formulated and coordinated and plans are drawn for their execution. The scientific results of programmes in progress are discussed at the numerous Scientific Symposia, Commission and Working Group meetings and other gatherings of scientists that are held during these assemblies. General Assemblies have been held since 1922 and, since 1963, at 4 years intervals. The last General Assembly was held in Melbourne, Australia in 2011.
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5. Other activities in 2011

Description Closing Ceremony of the International Year of Chemistry on 2011 December 1

On behalf of IUGG President H. Gupta and Secretary-General A. Ismail-Zadeh, the Closing Ceremony of the International Year of Chemistry 2011 (IYC2011, <http://www.chemistry2011.org/>) was attended by J. De Keyser (IUGG representative in Belgium).

The afternoon-filling program kicked off with opening words of HRH Prince Philippe of Belgium, M. Geoghegan-Quinn, EU Commissioner for Research, Innovation and Science, and by Prof. Nicole Moreau, President of IUPAC (International Union of Pure and Applied Chemistry). All speakers highlighted the importance of chemistry in our society and reviewed some of the accomplishments of IYC2011, mainly in the area of education and public outreach. Then followed a very lively programme in which a group of young chemists in research and industry visually put forward their vision of the future by telling the stories of three accomplished chemical scientists in 2050 ... In doing so, they highlighted the potential role of chemistry in addressing society's biggest challenges: to guarantee pure water, food, energy, and healthcare for all. They advocated concerted efforts involving industry, academia, government, and the general public. The program continued with lectures on antibiotics by A. Yovath (Nobel Prize in Chemistry 2009) and on organic LEDs and photovoltaics by J.L. Brédas (Francqui Prize 1997). There was an interesting panel discussion with scientists and industry leaders on various aspects of the future of chemistry, research, public-private partnership, the role of women in chemistry, and education. The IYC2011 was formally closed by M. Nalecz, Director, Division of Basic and Engineering Sciences at UNESCO, under whose auspices this International Year was organized.

The geophysics community might be interested in two particular achievements of IYC2011:

- A set of 9 lessons has been created for communicating climate change science, targeted at age 16-19 (<http://www.explainingclimatechange.com/>).
- A worldwide chemistry experiment "Water: A Chemical Solution" has been conducted during IYC2011. It actually consisted of running a set of four adaptable experiments focusing on water, aimed at a range of ages from primary school to high school. The experiments include determining the pH and salinity of water, which are parameters of geophysical relevance. The results are reported on the experiment's website (<http://water.chemistry2011.org/>).

This IYC2011 event was quite illuminating for a geophysicist, as it leads one to realize that there are very close ties between chemistry and geophysics. Some of the big challenges that were identified relate directly to geophysical problems. Hydrology plays a

major role in addressing the challenge for access to pure water, for instance. The quest for sustainable energy sources involves studies of solar irradiance, greenhouse gas emissions and atmospheric chemistry, carbon capture and sequestration and geologic storage.

6. Future perspectives

- The mandates of our effective and associated members have to be renewed every 4 years. The last time was in 2008, so it will be the case again in 2012. Letters for renewal have been sent in November 2011.
- The next IUGG General Assembly will be held in Prague, Czech Republic in 2015.
- The next BNCCGG General Assembly is planned on Thursday 26-1-2012.