

URSI/IAGA Joint Working Group on VERSIM (VLF/ELF Remote Sensing of the Ionosphere and Magnetosphere)

Business meeting - Wednesday 26 October 2005.

There was a meeting of the VERSIM working group during the International Union of Radio Science General Assembly, held in New Delhi (India), at 1230 on Wednesday 26 October 2005.

Present: Craig J Rodger (New Zealand) in the chair, acting on behalf of Michel Parrot (France) the URSI co-chair. Zen Kawasaki (Japan), A. P. Nickolaenko (Ukraine), G. Satori (Hungary), D. Hamar (Hungary), R.P. Singh (India), B. Singh (India), O. Santolik (Czech Rep), J. Lichtenberger (Hungary), A. Collier (South Africa), R. McCormick (New Zealand), A.J Smith (UK), D. Carpenter (USA), F. Darrouzet (Belgium), C. Price (Israel), E. Greenburg (Israel), J. Bor (Hungary), V. Kushwah (India), B. Sinjh (India), R. P. Singh (India), F. Nemeč (Czech Republic)

Chairman's Report:

Craig Rodger (the IAGA co-chairman), described the purpose and nature of the working group, and outlined activities of the working group since the previous URSI meeting, held in Maastricht (Netherlands) in August 2002. The last VERSIM meeting was at the IAGA meeting in Toulouse, France in July 2005. The report from the chair included a brief discussion on the yearly VERSIM newsletter, which is well supported by the community through a large number of reports made from many countries.

2nd VERSIM Workshop to be held in 2006

Last year a VLF Workshop was held in Sodankylä, Finland (27th September to 1st October 2004), hosted by our colleagues from the Sodankylä Geophysical Observatory. This meeting providing a fresh venue for the VLF community to gather and exchange information, and was a great success. After discussions amongst the participants, it was decided to run another workshop in 2006 (as no URSI or IAGA meeting will take place that year), with the possibility of the VLF Workshop becoming a "standard" feature of the VERSIM scientific community. We hope for some limited financial support from URSI and IAGA, and so may be able to assist some participants with accommodation costs.

At Toulouse, we discussed possible dates for a VERSIM workshop in Sodankylä, following on from the 2004 workshop. Based on feedback from those at the IAGA VERSIM meeting, the preferred start date was Monday 18 September 2006 (to avoid clashes with North American teaching times). However, at the URSI General Assembly a request was put forward to move the 2nd VERSIM workshop to be 1 week earlier. This has been passed to the Local Organising Committee, who are currently seeking opinions from the wider VERSIM community via email.

We have identified the following subject areas as probable sessions which will appear at the workshop.

Triggered Emissions and Nonlinear wave phenomena
VLF waves and the radiation belts (acceleration and loss)
ELF/VLF as a geophysics remote sensing tool (upper atmosphere, magnetosphere)
Effects of ELF/VLF radiation on the atmosphere (lightning/sprites, etc)
Instrumentation (as a poster session)

If you feel your VERSIM-Science area is not represented here, contact Craig Rodger ASAP, who will pass it onto the Local Organising Committee.

Mark your diaries now for the 2006 VERSIM workshop!

VERSIM Science Topics

It has been suggested that the VERSIM community could identify Science "Topics" that are of current interest to the wider international community. Obviously, groups in different regions will be better suited to support different topics. For example, ground based observations at high latitudes can provide important information on triggered emissions, which is extremely unlikely for observations made from equatorial locations. However, such locations are more likely to provide important data on lightning and red sprites.

A set of VERSIM suggested Science topics might aide some newer members of the community to focus their observations towards international "hot topics". In addition, groups who are working on a VERSIM Science Topic would be able to use this to support their local grant applications. The chair (Craig Rodger), has suggested that the community should put together a short listing of current topics, which would be placed upon our webpage. The VERSIM Science Topic list would involve a few sentences describing the topic-area, plus a few relevant references, and a contact name (or two).

This idea was first launched (in public) at the Toulouse working group meeting, having been suggested to Craig Rodger earlier in the year. There was support for this idea at Toulouse. There was also broad support at the URSI General Assembly, and thus the chair hopes we will start moving ahead with this through discussions on the VERSIM mailing list in 2006.

Symposia at future URSI Assemblies:

After some discussion a session on multipoint ground-satellite measurement was suggested. This was taken to the Commission G/H Business meeting, and incorporated into the planning for the 2008 meeting that will be held in Chicago.

Future of the working group:

It was unanimously agreed to recommend that the working group continue in existence for the period up to the next URSI meeting (2005-2008). At this time the issue will be put

to the VERSIM community again. This does not reflect a feeling that the working group should necessarily be wound up, it simply reflects the normal process for reporting to our parent bodies (URSI and IAGA).

URSI Chair of the Working group

Michel Parrot (*Laboratoire de Physique et Chimie de L'Environnement*, France), the URSI co-chairman, indicated that he would stand down from his role. Janos Lichtenberger (*Eötvös University*, Hungary) was nominated and elected unopposed at the meeting. Congratulations to Janos. Craig Rodger would like to point out to the community that Michel acted as the URSI co-chair of VERSIM from 1996-2005, serving our community throughout. On behalf of the entire VERSIM community, I would like to express our sincere thanks to Michel for his long-term efforts, much of which has been behind the scenes. While Michel has stepped down from the VERSIM co-chair position, I am sure he will remain an active member of our research community!

Reports from VERSIM research groups:

The chair suggested that participants should send in brief reports by email to ensure the details of national reports were correctly recorded and communicated to the wider VERSIM community. Emailed reports have been received from M Parrot (France), F Darrouzet (Belgium), I Nagano (Japan) and C Price (Israel). AP Nickolaenko provided a written report at URSI. CJ Rodger (New Zealand) has also added a report.

Belgium IASB-BIRA and CSR. Within the RABEM/SEVEM (Radiation Belts Models/Statistical ELF and VLF Environment Models) project at CSR (Center for Space Radiations, Belgium) the data from the wave experiment IMSC (Instrument Magnétomètre Search Coil) and ICE (Instrument Champ Electrique) onboard of DEMETER are analyzed. The modeling of the electromagnetic environment in the magnetosphere for VLF and ELF waves started with the creation of a database for the distribution of wave intensities. That means: Power Spectral Densities of E and/or B as a function of time, space, geomagnetic indices, solar wind parameters, ... In a second phase of this project, the waveforms will be analyzed and correlations between particle flux and wave characteristics will be studied.

Concerning CLUSTER data, the electric field spectrograms (2-80 kHz) measured by the resonance sounder and wave analyzer WHISPER are analyzed at IASB-BIRA (Belgian Institute for Space Aeronomy, Belgium) in order to determine the electron plasma frequency, and then the electron density during plasmasphere crossings. A multipoint tool (the spatial gradient) is used to assess the relation between the electron density distribution and the magnetic field inside the plasmasphere.

France LPCE If there is no major problem with the satellite and the experiments (up to now everything is nominal) DEMETER will record data until the end of 2006. Discussions will occur in May 2006 to know if we continue one year more.

An international workshop open to all scientists and related to the scientific objectives of DEMETER (seismic activity, anthropic activity, EM environment of the Earth at mid and

low latitudes) will be held in Toulouse on June 14-16 2006. Please consult the symposium website at <http://www.cnes.fr/colloques>.

Meanwhile LPCE prepare a new micro-satellite project named TARANIS (expected launch in 2009) to study the phenomena which occur between the top of the clouds and the lower ionosphere during thunderstorm activity.

Israel A brief report from the Department of Geophysics and Planetary Sciences, Tel Aviv University.

The group of Prof. Colin Price has three field stations running continuously to observed ULF, ELF and VLF radiation in the atmosphere. The ULF station is being used to study space weather effects and seismic anomalies. The ELF station is being used to study the Schumann resonances, and global lightning and sprites. The VLF station is being used to study lightning and sprites, as well as possible signatures from meteors.

Japan A small workshop "2nd Kanazawa Workshop on Waves in Plasmas and Electromagnetic Applications" will be held on March 23-24, 2006, at Kanazawa University, Kanazawa, Japan. It will deal with the theory, observation, and simulation of space plasma waves, and some related topics of electromagnetic applications such as EMC/EMI, antennas, and hyperthermia. For further information, please visit our web site (<http://reg.is.t.kanazawa-u.ac.jp/Kanazawa-WS/>).

In order to estimate the dynamic motion of ionospheric exit points of natural ELF/VLF waves, such as polar chorus and auroral hiss, we have plan ground-based multipoint observations at three bases by using loop antenna systems in Antarctica for a year from February 2006. These systems consist of two crossed vertical loop antenna and multi channel analyzer where measures continuously at 6 seconds resolution the mean power and polarization in 4 spaced frequency bands (500, 1 k, 2 k and 6 kHz). The observation will be conducted with the aid of the imaging riometer observation at Syowa Station, which tells the area of small absorption in the ionosphere, possible candidate of exit points of ELF/VLF waves, and also with the ELF/VLF wave observations onboard Akebono satellite (Ozaki, Nagano (Kanazawa Univ.) and Yamagishi,Sato (NIPR)).

Ukraine Usikov Institute for Radiophysics and Electronics Nat. Acad. Of Science of the Ukraine

1. Monitoring of SR at Lehta observatory (64° N, 34° E). Final processing of data accumul up to 2003.
2. Annual / diurnal batteries in "Variable" and "podium" components of SR intensity.
3. SR modeling at Titan.
4. Modifications of SR parameters by SPE.
5. Anomalous SR signals as a result of localized ionospheric modification related to seismic activity.
6. Source models (lighting distribution in space and time) that are obtained from OTD data.

7. Japanese thermometer: SR intensity and global soil temperatures.

New Zealand University of Otago AbsPAL VLF phase and amplitude observations have been used to extend the solar flare response of D-region electron densities up to the level of the great X45 flare of 4 November 2003. The VLF signals used at Dunedin were NLK (Seattle, 24.8 kHz), NPM (Hawaii, 21.4 kHz), NDK (25.2 kHz, North Dakota), and 'Omega Australia' (13.0 kHz, Sale). Also used were NPM signals recorded at Ny Alesund, Spitzbergen. The size of the Great Flare was determined by extrapolating the GOES X-rays fluxes (which saturated at X17.4) using the VLF phase changes (which did not saturate!) using the VLF phase changes which tracked the GOES fluxes very well. In addition (and independent of VLF measurements) the XL/XS ratio (i.e., the flux ratio of the long, 0.1-0.8 nm, and the short, 0.05-0.4 nm, X-ray bands) during big flares also gives X45 for the Great Flare. AbsPAL VLF phase and amplitude recordings are continuing in Dunedin and (on Study Leave) in Cambridge.

In the last year we have undertaken significant studies in collaboration with the British Antarctic Survey, focused on particle precipitation into the ionosphere. This includes increasing our understanding of whistler induced particle precipitation (WEP), both in terms of the ionospheric effects and the significance as a loss process in the inner radiation belt and slot region. Together with our collaborators, we are building a network of subionospheric VLF monitors to study energy inputs into the lower ionosphere. These monitors form the Antarctic-Arctic Radiation-belt Dynamic Deposition VLF Atmospheric Research Konsortia (AARDDVARK). Recently we have used the data from our AARDDVARK monitors to examine effects of Solar Proton Events (SPE) on the high-latitude ionosphere, and the importance of Relativistic Electron Precipitation to the radiation belts. Working with the University of Oulu and Finnish Meteorological institute, we have examined the importance of SPE to atmospheric chemistry, particularly the production of ozone destroying chemicals.

The groups studies have also focused on the growing World Wide Lightning Location Network (WWLLN), which now has ~22 receiving locations spread across the world. This VLF based lightning detection and location network sends lightning observations back across the internet to central processing computers in Seattle, USA (University of Washington) and Dunedin, NZ (LF*EM Research). The WWLLN is unlike any other global scientific lightning detection system in that it operates in real-time, with only a few seconds delay before a lightning location is registered. Working with the PIs of the network Professors Dowden (LF*EM Research) and Holzworth (University of Washington), we have a growing understanding of the capabilities of the WWLLN. Both cloud to ground and cloud lightning are detected, although the WWLLN is strongly biased to high peak current discharges. The University of Otago group is now focused on working on the detection efficiency of the WWLLN, with the intention of developing methods to describe the peak currents of detected lightning.

Other business:

None.

The VERSIM meeting broke up at around 1315.