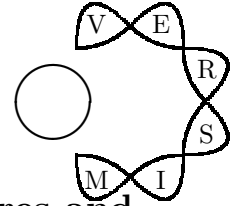


IAGA/URSI
Joint Working Group on



VLF/ELF Remote Sensing of Ionospheres and Magnetospheres

Editor: A J Smith

Newsletter

No. 16 — May 2002

Dear colleagues,

The 27th General Assembly of URSI (International Union of Radio Science), one of the working group's two parent bodies, is now less than 3 months away and will be held in Maastricht, Netherlands. I hope that many of the VERSIM community will be able to attend the assembly, and take the opportunity to meet and discuss matters of common scientific and technical interest in the VERSIM field. We plan to hold a meeting of the working group at Maastricht, where we will review recent VERSIM activities and consider what role the working group is or should be playing in the future. This issue of the *VERSIM Newsletter* contains information about the general assembly and other forthcoming meetings, together with other VERSIM news. I will look forward to seeing many of you in Maastricht.

URSI, 2002

The 27th URSI General Assembly will be held in Maastricht, the Netherlands, 17-24 August 2002. The conference venue will be the MECC (Maastrichts Exposit Congres Centrum). For details, see the website <http://www.URSI-GA2002.nl/> or email the Local Organising Committee at URSI2002@tue.nl.

Science sessions

There will be no specifically VERSIM session, but the following should be of interest of interest to VERSIM:

- E7: *Terrestrial electromagnetic EM phenomena*
- H4: *Plasmaspheric structure and phenomena*
- HG1: *Spacecraft and ground observations of stimulated and natural space-plasma waves*
- HGE1: *Lightning effects in the ionosphere and the radiation belts*

VERSIM Business meeting

There will be a meeting of the VERSIM working group during the Maastricht Assembly, at **1800 on Monday 19 August 2002** in Room 0.6 (called Madrid) of the MECC. The draft agenda is: 1. Chairman's Report; 2. Future of the working group; 3. Reports from VERSIM research groups; 4. Symposia at future IAGA and URSI Assemblies; 5. Any other business. If you have any specific issues you would like to discuss, please let one of the co-chairmen know (see below for addresses, etc.). **All are welcome!**

IUGG, Sapporo, 2003

The 23rd General Assembly of the International Union of Geodesy and Geophysics, which encompasses IAGA, will be held in Sapporo, Japan, 30 June – 11 July 2003. The scientific programme and information on how to register for the assembly may be found on the Web site:

<http://www.jamstec.go.jp/jamstec-e/iugg/>, or contact the organising committee at email: iugg_service@jamstec.go.jp or fax: +81 468-67-9315. There will be several sessions of interest to VERSIM, but particularly:

Whistler-mode waves and their effects on the radiation belts

This session, GA 3.10, convened by K. Yamamoto, F. Menk and A.J. Smith, will focus on "the use of ULF, ELF and VLF waves as diagnostic probe of the solar wind-magnetosphere-ionosphere coupled system for a space weather study. These waves convey information about the dynamics and morphology of the magnetosphere and its coupling to the solar wind and ionosphere. Papers obtained by new and established coordinated ground and space-based observations for a space weather study are strongly encouraged."

VERSIM Business meeting

There will be a meeting of the VERSIM working group during the Sapporo Assembly, on the evening of **Monday 7 July 2003** (venue to be announced).

IAGA, Hanoi, 2001

Whistlers, Particle Precipitation and Low-latitude VLF Phenomena

This VERSIM sponsored session was held on Tuesday 28 August 2001. It began with a talk by **Arthur Hughes** on "whistler ghosts" seen at Marion Island. The interpretation is that the first, strong whistler was somehow triggering the second, weaker whistler. If this was through gyro-resonant interactions with counter-streaming electrons, it would imply an off-equatorial interaction region.

Hisao Yamagishi reported on the results of a statistical analysis of 17 years of ELF/VLF observations at Syowa and Iceland. Hourly averages were used of data from ten channels covering the frequency range 0.35 - 90 kHz. Particularly highlighted were the higher levels found

during sunlit ionospheric conditions (day time and polar summer). This is the opposite of what would be expected (increased ionisation in the D-region leading to enhanced absorption), and with what is observed at lower latitudes such as Halley.

Andy Smith presented work by BAS and collaborators at Augsburg College (Mark Engbretson and Alexa Halford). The study used ELF/VLF data from Halley, A80, A84, and South Pole. Evidence was presented to show that periodic emissions driven by echoing whistlers are associated with type-II QP (Quasi-periodic) VLF emissions with modulation frequencies in the range 10-100 mHz. Changes in ionospheric conductivity leading to field aligned currents and Alfvén waves which modulate the QPs provide a possible mechanism.

Janos Lichtenberger from the Eötvös University group, Hungary, described progress in the automatic detection of whistlers. Analogue methods had been shown not to work, particularly in the presence of spherics or when the signal-noise ratio is poor. A new technique he and his co-workers had developed used pattern recognition in spectrograms. Examples of its use on whistlers recorded at Tihany were impressive. Although some human intervention was still necessary, this was minimal compared with previous methods, which raises the possibility of providing routine plasmaspheric densities in near-real time from ground observatories.

Sandra Chapman presented the application of chaos theory to the problem of trapped and untrapped electrons in a VLF wave field. In the simplest case monochromatic waves were used, but the study was later extended to wave packets. At low wave amplitudes the electron orbits in phase space are well-behaved but as the wave amplitudes are increased, the trajectories interact and become more disordered.

Papers on whistler observations at Great Wall Station, Antarctica by Peng Feng-Lin and VLF phenomena at low latitudes by A.K. Gwal were not given as the speakers did not turn up.

VERSIM Business meeting

There was a meeting of the VERSIM working group during the Hanoi Assembly, at 1145 on Tuesday 28 August 2001. Present: Andy Smith (UK) in the chair, David Boteler (Canada), S Fukao (Japan), Bob Horita (Canada), Arthur Hughes (South Africa), James LaBelle (USA), Craig Rodger (New Zealand), Michel Parrot (France), Jean Louis Rauch (France), Bob Schunk (USA), Jean-Gabriel Trotignon (France), Hisao Yamagishi (Japan).

Chairman's Report

Andy Smith, the IAGA co-chairman, summarised the activities of the working group since the last IAGA (IUGG) and URSI Assemblies in 1999, held at Birmingham and Toronto respectively.

Future of the working group

From the URSI side, this will be reviewed at the 2002 URSI General Assembly in Maastricht. From the IAGA side, it would be reviewed at the Sapporo Assembly in 2003. Smith indicated that if the working group continued past then, he wished to stand down as IAGA co-chairman.

Reports from VERSIM research groups

UK. Andy Smith summarised the current VLF/ELF observations being made by British Antarctic Survey. Future plans included the decommissioning of the Automatic Geophysical Observatories between Halley and South Pole, and the setting up of a new global network, VELOXnet, to cover all local times at every UT.

Hungary. Janos Lichtenberger was unable stay for the meeting, but a report was presented on his behalf. The new ELF/VLF wave receiver SAS-2, developed by the Eötvös University group, now includes an automatic whistler detector. It was planned to fly the instrument on the KOMPAS, PRECURSOR, and VULCAN space missions. The aims were both traditional whistler research and new seismic event related work.

France. Michel Parrot briefly mentioned the DEMETER mission; an AO for this will be issued soon, for scientists wishing to participate. A new mission is TARANIS (the name of the thunder-god of ancient Gaul), an acronym translating to Tool for analysis of radiation from lightning and sprites. This will carry a range of optical and electromagnetic sensors, including X-ray and gamma ray detectors.

Japan. Hisao Yamagishi described a Polar Patrol balloon experiment. Four stratospheric balloons will be launched from Syowa station Antarctica beginning in December 2002. Designed to stay up for 2 weeks, they carry instruments to measure magnetic and electric fields, and ELF/VLF emissions. Data will be sent back to Antarctic ground stations using the Iridium satellite network. The mission is aimed at a study of the cusp. The ground based ELF/VLF observations are continuing at Syowa, where they have been carried out for 20 years. The instrumentation is now becoming old, and the future of the programme is being reviewed.

USA. LaBelle reported that the South Pole VLF beacon proposed by Stanford University (Umran Inan) had now been funded and was proceeding. A number of international partners will be involved in receiving the beacon signals.

New Zealand. Rodger gave a brief report on the recent meeting at Queenstown which focussed on the outer radiation belts. He mentioned the SCODAR VLF instrument which was currently running at Dunedin to observe whistler mode and subionospheric signals from VLF transmitters in the northern hemisphere; the new Chinese transmitter is now observable but the one in India is not sufficiently stable. A new long-range lightning detection network (TOGA) for the western Pacific is being commissioned. It is capable of locating lightning as far away as India. Scientific work on sprites and also on the ionospheric effects of solar flares (with BAS) is continuing.

South Africa. Hughes noted that measurements of VLF were continuing at Sanae beside magnetometer, radar and auroral observations. A conjugate sprite campaign between South Africa and France had been organised.

Symposia at future IAGA and URSI Assemblies.

URSI, Maastricht, 17-24 August 2002

There are several sessions relevant to VERSIM on the planned programme: *Wave and Coherent Structures in Space Plasmas, Plasmaspheric Structure and Phenomena, Spacecraft and Ground Observations of Stimulated and Natural Space-Plasma Waves, Lightning Effects in the Ionosphere and the Radiation Belts, Analysis methods for Plasma Waves and Turbulence.*

IAGA, Sapporo, 30 June - 11 July 2003

The IAGA Division III (magnetosphere) had been held the previous week, and the outline programme for Sapporo decided. There would be two concurrent sessions: one focussed on science and the other on techniques. Waves, both ULF and VLF, were well covered in both, and other interests of VERSIM were covered elsewhere in the proposed programme. The Division II (ionosphere) business meeting was yet to be held. A sprite/lightning session was being proposed, which should cover the main VERSIM interest in this Division. No specific VERSIM session was proposed for Sapporo.

SEVEM (Survey of ELF and VLF Experiments in the Magnetosphere)

Andy Smith gave a report on the project on behalf of Joseph Lemaire and Fabien Darrouzet. The project is supported by a resolution passed at the VERSIM meeting in Toronto. More details may be found on the SEVEM web page: <http://www.magnet.oma.be/sevem/>.

Any other business

Craig Rodger reminded the meeting of two relevant future meetings: The Asia-Pacific Radio Science Conference will be held in Beijing in 2003, just before the Sapporo Assembly, and the AGU Western Pacific Geophysics Meeting will be held in Wellington next year.

The meeting ended with thanks to the chairman expressed from the floor.

The ESF Scientific Network SPECIAL

The following news item has been received from Martin Fuellekrug (email: fuellekr@geophysik.uni-frankfurt.de):

The European Science Foundation (ESF) (see webpage at <http://www.esf.org>) supports a scientific network on Space Processes and Electrical Changes Influencing Atmospheric Layers (SPECIAL) (see webpage at <http://sgo.fi/SPECIAL>). In this interdisciplinary area, possible links between changes of energetic charged particle fluxes and of weather and climate occurring via electrical processes in the atmosphere are investigated by studying solar activity, magnetospheric variability, clouds, thunderstorms and lightning.

The approach is based on the physical mechanisms by which space weather and the Earth's weather are causally linked. The energy input to different atmospheric layers, from above and below is considered, as is the energy transfer from one location to the other.

The SPECIAL scientific network has held three meetings since 1999, which engendered considerable interdisciplinary discussion and research. During the most recent SPECIAL meeting, from Jan. 3-6, in Cambridge, UK, the SPECIAL community (currently approx. 40 scientists from Europe and Russia) started to plan for a larger scientific project in which atmospheric electrodynamic processes in the atmosphere and their relation to climate are being investigated. Seven different workpackages and representatives have been identified.

WP1:

Ionosphere (Thomas Ulich: thu@sgo.fi)

WP2: Cosmic

rays and energetic particles (Mikhail Pudovkin: pudovkin@snoopy.phys.spbu.ru)

WP3: Solar

wind and inter planetary magnetic field (Oleg Troshichev: olegtro@aari.nw.ru)

WP4: Sprites and lightning (Torsten Neubert: neubert@dsri.dk)

WP5: Global circuit (Brian Tinsley: tinsley@utdallas.edu)

WP6: Cloud microphysics (Giles Harrison: r.g.harrison@reading.ac.uk)

WP7: Schumann resonances and climate (Colin Price: colin.price@ec.gc.ca)

The SPECIAL community intends to place a bid for a large scale collaboration to the European Commission. The next meeting will most likely be held at the beginning of the year 2003 in Frankfurt/Main, Germany. Further contributions from the scientific communities in space weather and the Earth's weather research are strongly encouraged. Please contact the respective workpackage representatives in this regard.

VERSIM Electronic Mailing List

The VERSIM electronic mailing list is available for use by the VERSIM Community. Details (including how to subscribe and unsubscribe) and posting guidelines, are available on the VERSIM website at: <http://www.nerc-bas.ac.uk/public/uasd/versim/vrsmeml.html>. Please send any information of interest to other members of the working group, directly to the electronic mailing list at versim@mail.nerc-bas.ac.uk. It will be relayed to everyone who is subscribed to the list. Send any comments to owner-versim@mail.nerc-bas.ac.uk.

The role of the VERSIM Working Group

The working group serves as a forum for workers studying the behaviour of the magnetosphere and ionosphere by means of ELF and VLF radio waves, both naturally and artificially generated. Originally the emphasis was on probing of the magnetosphere by whistlers, but later the scope became somewhat broader. The group aims to promote research in this field by facilitating the exchange of ideas, information and experience between active research workers and other interested scientists. This is done through regular meetings at IAGA and URSI Assemblies, and via the circulation of a newsletter. The

group has also been active in sponsoring scientific symposia at IAGA and URSI Assemblies, in areas relevant to its field of interest, and in coordinating observational campaigns. There are currently ~92 scientists from 21 different countries (Australia, Belgium, Brazil, Canada, China, Czech Republic, Finland, France, Germany, Hungary, Israel, Japan, Netherlands, New Zealand, Norway, Russia, Serbia, South Africa, Ukraine, UK and USA) on the VERSIM mailing list.

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