

# **3rd VERSIM Workshop 2008 Conference Report; ELF/VLF Radio Phenomena: generation, propagation and consequences in observations, theory and modelling.**

Tihany, Hungary (15 – 20th September 2008).

## **Overview**

The 3rd VERSIM Workshop took place in September 2008 at the Balaton Limnological Research Institute (BLRI) of Hungarian Academy of Sciences, sponsored by Eötvös University and supported by IAGA and URSI Commission G and H. This was a chance for the VERSIM IAGA/URSI joint working group to meet and discuss current issues, developments, and techniques. The workshop attracted slightly more than 50 participants from 15 countries, ranging from India and Serbia all the way to Brazil and the USA, and included 61 presentations. Due to the increased number of presentations the workshop length was increased by one day, to maintain the established structure of the timetable; oral presentations to of a sensible length (~20-30 min), interspersed by good-length coffee and lunch breaks in which participants could follow up with more detailed discussions, or plan future scientific collaborations.

The 3rd workshop builds on the success on the previous 2 meetings, which were held in Sodankylä, Finland. With steadily more participants and more presentations at each VERSIM workshop, it is clear that the workshops are filling an important role for the VERSIM community. Many of the participants at the 3rd workshop commented that the quality of the talks had steadily improved with each VERSIM workshop, suggesting that the collaborations established through VERSIM workshops were leading to rapid forward motion in VERSIM-Science. Participants at the 3rd workshop agreed that the success of this workshop confirms the viability of recurring VERSIM workshop as part of our future scientific calendars.

Many past VERSIM chairs were present at the 3rd workshop, including Don Carpenter (Stanford University, USA) who was the first chair of the *Whistlers in the Magnetosphere URSI* joint committee. This evolved into the current joint URSI-IAGA VERSIM working group. During the business meeting at the end of the workshop the current chairs paid tribute to all the previous VERSIM working group chairs, most of whom are still active members of the VERSIM community.

The 3rd VERSIM workshop was marked by a significant series of talks on the use of VLF and ULF waves to provide plasmaspheric parameters, both electron density and mass density, which when combined allow ground-based observations of plasmasphere composition. Some VERSIM researchers are rapidly moving towards automated detection and analysis of VLF whistlers and ULF-field line resonances, which should provide near-continuous ground-based plasmaspheric measurements from multiple stations. Combined with the power of the internet, near-realtime reporting of plasmaspheric parameters should be possible in the near future. This is a highly promising development, linking to the earliest goals of the working group (and its predecessors), made possible by recent improvements in technology and growing scientific understanding. At the same time, these studies have pointed to gaps in our knowledge as to detailed route by which ground-based VLF sources couple into

space, for example the VLF radiated by a lightning discharge creating whistlers. Several reports focused on the finer details of this coupling, through ray-tracing and entirely experimental measurements. In addition, multiple papers dealt with the interaction between waves and energetic electrons in the radiation belts, both as a mechanism for affecting the waves, or the particles (acting as an acceleration or loss process). One set of invited talks at the 3rd VERSIM workshop offered homage to workers in our field over more than 4 decades of research, providing context for our current efforts. Another invited talk focused on high-end experimental observations, where 1 days wideband ground-based recording and analysis leads to many hundreds of gigabytes of data, with a noise floor of  $100 \text{ aT/Hz}^{-1/2}$ . A very common feature throughout the workshop was the use of observations from the Centre National d'Etudes Spatiales (CNES) DEMETER spacecraft. The launch of DEMETER was reported at the first VERSIM meeting in September 2004, and has made such an impact on the community that roughly 50% of the presentations made use of DEMETER data. A full listing of the abstracts presented at the 3rd VERSIM workshop can be found at:

<http://sas2.elte.hu/versim/versim1.htm>

The support from URSI, IAGA and local sources was used

- to support the participation of 9 young scientists from Hungary, New Zealand, South Africa and USA with waived registration fee and free accommodation,
- to support the participation of 3 scientists from disadvantaged nation (India, Russia and Slovakia) with waived registration fee and/or free accommodation,
- to cover the air fares of 2 invited scientist (Don Carpenter, Stanford University, USA and Tauno Turunen, SGO, Finland)

As part of the IAGA support for the 3RD VERSIM Workshop, an award was offered for the best paper presented by a young researcher. The award consists of support to participate in the next IAGA General Assembly (Sopron, Hungary in 2009): a low-cost air ticket, waiving of the registration fee, and USD 200 as a contribution to cover hotel and subsistence costs. The Scientific Committee of the 3rd VERSIM Workshop proposed Mr. Mark Golkowski for the IAGA Young Scientist Presentation Award. Mr. Golkowski is a PhD Student at Stanford University (USA). His presentation focused upon ELF/VLF triggered emissions generated by the High Frequency Active Auroral Research Program (HAARP) facility in Alaska. The ELF/VLF wave generation by heated modulation of the ionospheric auroral electrojet currents allow controlled magnetospheric wave injection experiments. The HAARP facility has been used to inject ELF/VLF waves into the magnetosphere to trigger wave-particle interactions that result in the non-linear amplification of the wave. Amplified and triggered waves are observed on the ground at both ends of the magnetic field line and also on the DEMETER satellite. Ground-based observations in the conjugate region came from an ELF/VLF receiver onboard a buoy tethered in the South Pacific in an ocean many kilometres deep! The combination of multiple receiving sites with the HAARP facility provided new understanding into the production and propagation of these emissions, and was delivered in a highly polished manner. Well done Mark!

Some idea of the success of this session can be found on the Photos page of the 3rd VERSIM Workshop 2008: <http://sas2.elte.hu/versim/photos>

## **Future**

On the basis of discussions which took place during the 3rd workshop, our colleagues from the Czech Republic have offered to host the next workshop in Prague. It was felt that the time in which VERSIM workshops are currently taking place leaves a sensible gap between URSI/IAGA meetings and the VERSIM workshops, and hence that the 4th workshop will occur sometime in September 2010, possibly in the first week of that month. Our Czech colleagues will contact the community with some possible dates. The meeting strongly endorsed this plan, and thanked our Czech colleagues for taking this task on.

Craig J. Rodger and János Lichtenberger  
VERSIM Working Group Chairs

## **Social Events and Excursions**

As with all successful scientific meetings, there were a number of excellent social events and excursions to broaden the experience of the Workshop participants. Our excursions included an excursion and reception on Lake Balaton, onboard the Steamboat Kelén, built in 1891 and the oldest vessel on the lake. The excursion was followed by a concert of traditional Hungarian folk music, performed by the Muzsikás Ensemble. This was a special present to the 3rd Workshop from the conference organisers, and was particularly fitting given that one of the Ensemble, Dániel Hamar is an active researcher inside the VERSIM community! During the concert our Hungarian colleagues provided samples of Hungarian "Palinka", made by the chair of the Local Organising Committee, János Lichtenberger. Muzsikás has previously played in famous concert venues across the world, and are the winner of the 2008 WOMEX Award, but during the 3rd VERSIM workshop they entertained the participants with a special dedicated concert. This is likely to be the longest lasting memory of the workshop for many of the participants, despite the high quality scientific presentations which occurred during the day. The Workshop hosts also arranged wine tasting, a visit to a monastery founded 953 years ago, meals, rounded off with a medieval evening in Sümeg castle during which one of the participants was "knighted". The participants and accompanying people were thoroughly looked after by the meeting hosts. I'd would like to point out that the levels of Hungarian hospitality we experienced bodes well for the next IAGA General Assembly, to be held in Sopron (Hungary) in August 2009!

Craig J. Rodger

## Some photos



The 3rd VERSIM Workshop, group photo outside the Balaton Limnological Research Institute building.



Mark Golkowski (on left in foreground), winner of the IAGA Young Scientist Presentation Award, at the conference dinner.



Looking back towards Tihany during the VERSIM excursion onboard the Steamboat Kelén.