



# Commission H

## 2008-2011 Triennial Report

### 1. In Memoriam

**Wynne Calvert** died at his home in Iowa on 10 November 2009 at the age of 72. He made pioneering contributions in the field of ionospheric and magnetospheric radio propagation, particularly in the interpretation of signals received by space-borne radio receivers and ionospheric topside sounders, and to our understanding of the generation of auroral kilometric radiation. He enjoyed lively scientific interactions at URSI General Assemblies and enthusiastically conveyed his passion for science to students in colleges and universities in the USA and Japan.

**Robert Helliwell**, emeritus professor of electrical engineering at Stanford University, died at his Palo Alto home on May 2, 2011 at the age of 90. He was one of the first to recognize and then exploit the great potential of whistler-mode waves to remotely probe both the dense thermal component as well as the tenuous energetic component of the Earth's magnetospheric plasma. In early work he observed wave emissions triggered through non-linear interactions of energetic electrons with whistler-mode transmitter signals, and he later established a successful program of controlled wave injection experiments from Siple Station, Antarctica. With his students he led major advances in knowledge of the propagation of naturally occurring and man-made whistler mode waves, in understanding of resonant wave-particle interactions in space, and in studies of ionospheric perturbations caused by wave induced precipitation of particles from the radiation belts.

## 2. Meeting Support

During the triennium, 9000 Euro is allocated to each Commission to be spent for the support of meetings and the attendance at the GASS of tutorial lecturers or invited scientists. Commission H supported the following meetings financially (mode B) with a contribution between EUR 500 – 1500:

- 3rd VERSIM URSI-IAGA workshop, Tihany, Hungary, 15-20 September, 2008
- 12th Workshop on the Physics of Dusty Plasmas, Boulder, CO, USA, 18-20 May 2009
- IHY-Africa / SCINDA 2009 Workshop, Livingstone, Zambia, 7-12 June 2009
- IRI 2009 Workshop, Kagoshima, Japan, 2-7 November 2009
- 8th International Nonlinear Waves workshop, La Jolla, CA, USA, in February 2010
- 4th VERSIM URSI-IAGA workshop, Czech Republic, 13-17 September 2010.
- AP-RASC'10: 3rd Asia-Pacific Radio Science Conference, 22-25, September 2010, Toyama, Japan
- ESWW7 - Seventh European Space Weather Week, Brugge, Belgium, 15-19 November 2010
- International Symposium on Recent Observations and Simulations of the Sun-Earth System (ISROSES-II) in Borovets, Bulgaria, 12-16, September 2011

Commission H also provided support in mode A (non financial aid), which means they can use the URSI badge to help promote the meeting, for the following meetings:

- Microwave-08, Jaipur, India, in late November 2008
- International Workshop on Chorus Plasma Waves, La Jolla, California, USA, 8-11 or 18-20 February 2009
- MST12 - 12th Workshop on Technical and Scientific Aspects of MST Radars, London, Ontario, Canada, 17-23 May 2009
- EMC 2009, VIII International Symposium and Exhibition on Electromagnetic Compatibility and Electromagnetic Ecology, St Petersburg, Russia, 16-19 June 2009
- ISSS-9 - 9<sup>th</sup> International School for Space Simulations, Paris, France, 3-10 July 2009
- ICEAA'09 - International Conference on Electromagnetics in Advanced

Applications, Torino, Italy, 14-18 September 2000

- META'10 – 2<sup>nd</sup> International Conference on Metamaterials, Photonic crystals and Plasmonics, Cairo, Egypt, on 22-25 February 2010
- SCOSTEP - STP12, Berlin, Germany, 12-16 July 2010
- COSPAR Scientific Assembly, Bremen, Germany, 18-25 July 2010
- ICEAA-APWC 2011, Torino, Italy, 12-17 September 2011

### 3. Publications

The following review and tutorial papers on various topics of Commission H have been published in the Radio Science Bulletin over the last three years.

- H. G. James, Understanding Solar-Terrestrial Plasmas at a Distance with the Haselgrove Equations, RSB, No 327, (December, 2008), pages 17-21.
- I. Kimura, A Review of Whistler-Mode Ray-Tracing Techniques Originated from the Work by J. Haselgrove, RSB, No 327, (December 2008), pages 22-25.
- D. M. Walker, Ray Tracing in the Magnetosphere, RSB, No 327, (December 2008), pages 26-38.
- R. L. Dowden et al., World-Wide Lightning Location Using VLF Propagation in the Earth-Ionosphere Waveguide, RSB, No 327, (December 2008), pages 39-53.
- Shing F. Fung, The Virtual Wave Observatory (VWO): A Portal to Heliophysics Wave Data, RSB, No 332 (March 2010), pages 89-102
- Robert F. Benson, Four Decades of Space-Borne Radio Sounding, RSB, No 333 (June 2010), pages 24-44
- Gordon James, A Review of the Major Developments in Our Understanding of Electric Antennas in Space Plasmas, RSB, No 336 (March 2011), pages 75-94

The Vice Chair of Commission H, Ondrej Santolik, has been working as the associated editor of RSB, and he is expecting 6 reviews to come on the following topics.

- Wave Distribution Functions in Magnetospheric Physics,
- Role of ULF waves in radiation belt dynamics

- Collisionless shocks in space plasmas
- Spacecraft-plasma interaction in space
- Review on active sounding
- Wave Acceleration and Loss Processes at the Earth and Planets

#### 4. Working Group Activities

- HEJ: Supercomputing in Space Radio Science

Co-Chair for Commission H : Y. Omura (Japan) and B. Lembège (France)

URSI has been supporting a series of meetings known as the International School / Symposium for Space Simulation (ISSS) since the 1<sup>st</sup> meeting in Kyoto in 1982. During the last three years the 9<sup>th</sup> ISSS was held in Paris to train the next generation of the space scientists. The 10<sup>th</sup> ISSS is scheduled to be held in Canada in 2011.

- URSI/IAGA: VLF/ELF remote Sensing of the Ionosphere and Magnetosphere (VERSIM)  
Co-Chair for Commission H and G: J. Lichtenberger (Hungary)

The 4th workshop of the URSI/IAGA Joint Working Group on VLF/ELF Remote Sensing of the Ionosphere and Magnetosphere (VERSIM) took place in Prague, Czech Republic, on 13-17 September 2010. The workshop was organized by the Institute of Atmospheric Physics, Prague, Czech Republic and by Charles University, Faculty of Mathematics and Physics, Prague, Czech Republic. The scientific sponsorship and financial support for this workshop has been provided by the International Association of Geomagnetism and Aeronomy (IAGA) and by the Union Radio-Scientifique Internationale (URSI). More details can be found on the workshop website (<http://www.ufa.cas.cz/versim10/>).

#### 5. Long Range Planning Committee

A meeting of the Long Range Planning committee was held in Belgium in April, 2010. Commission H identified emerging scientific issues as follows.

- (1) Space Weather - impact of the Sun on the Earth's magnetic field and charged particles  
Particle acceleration, transport and loss in the radiation belts cause damage to spacecraft, interruption to satellite operations, and services, delayed

satellite launches and space insurance claims amounting to hundreds of millions of \$. Also disruption to defence related security systems. Understanding the basic physics will help build models to forecast warnings, and evaluate extreme events.

(2) Space Radiation Environment

Electron acceleration in solar flares and interplanetary shocks, and acceleration of cosmic rays, which cause a hazard to spacecraft, astronauts and aviation, particularly aircrew and avionics in high flying aircraft on polar routes, and which may affect the atmosphere. Understanding the basic physics will help provide warning and evaluation of extreme events.

(3) Exploration of planetary environments

Fundamental science of wave-particle interactions at the Moon, Mars, Jupiter and other planets and other smaller bodies in the Solar System

(4) Artificial plasma wave excitation in the magnetosphere

Active experiments with transmitters and lab plasmas provide a basic test of fundamental science with applications to deplete radiation belt electrons to protect spacecraft on orbit from a high altitude nuclear threat

## 6. URSI General Assembly, Istanbul, 2011

### 6.1 Scientific Sessions

Commission H has arranged

**H01** – Nonlinear Waves and Turbulence in Plasmas

**H02** – Micro/macro-scale Kinetic Processes at Boundary Layers in Terrestrial and Planetary Environments

**H03, H04** – Wave-particle Interactions and Their Effects on Planetary Radiation Belts

**H09** – Laboratory Simulation of Space and Dust-related Phenomena

**H10** – Waves as Signatures of Inflowing Plasma Interaction with Solar System Bodies

**HG1, HG2** – Radio Sounding in Ionospheres and Magnetospheres and Associated Plasma Phenomena

**HG3, HG4** – Active Experiments in the Ionosphere and Magnetosphere

**H11** – Open session

Other Related Sessions:

**CHGBDJK** – Solar Power Satellites and Wireless Power Transmission

EGH – Terrestrial and Planetary Electromagnetics

**GHE1, GHE2** – Lightning Induced Effects in the Ionosphere and Magnetosphere

**GHE3** – Electromagnetic Effects in Lithosphere-Atmosphere-Ionosphere Coupling

**HP1, HP2** – Poster Session

## **6.2 Papers**

Commission H accepted 144 papers (86 oral papers + 58 poster papers). The number of papers in each session is indicated in the parenthesis after the session name.

H01 (7), H02 (10), H03 (11), H04 (3), H09 (7), H10 (9), H11 (7), HG1 (6), HG2 (9), HG3 (11), HG4 (6), HP1 (31), HP2 (27)

## **6.3 Tutorial Lecture**

Commission H tutorial lecture is given by H. G. James with a title: Major developments in our understanding of electric antennas in space plasmas.

## **6.4 Young Scientist Award**

The young scientist awards were given to 8 young scientists from Commission H: Taisei MOTOMURA, Masafumi SHOJI, Brant E. CARLSON, Natalya M. SHMELEVA, Brett DELPORT, Marlie M. VAN ZYL, Nicholas L. BUNCH, Morris B. COHEN. Three of these young scientists received an additional grant from URSI to cover part of their travel.

## **6.5 Student Paper Competition**

Five student papers were submitted through Commission H (three papers from the USA, one from Russia, and one from India). After the review process, one of these papers has been selected for the final round of the competition where the students from ten commissions present their work just before the GA.

## **6.6 Commission H Travel Support for Young Scientists**

At the General Assembly in Chicago, the URSI Council voted for an additional

per-commission support of 3000 Euro, to be spent to bring graduate students to the URSI GA 2011. Commission H supported ten students and young scientists, who applied for the Young Scientists Awards, but were not awarded in spite of good quality of their submitted papers.

### **7. Vice Chair Election**

The call for nominations for new Vice Chair was sent out in early February 2011. Two excellent candidates have now been nominated and postal voting is in progress. One candidate will be elected at the first Commission H business meeting, which will be held on the first Monday evening of the GA in Istanbul.

I would like to take this opportunity to thank the Vice Chair Ondrej Santolik, for his valuable advice and support, and wish him every success in the coming triennium.

Yoshiharu Omura,

Chair, Commission H