

Commission G: Ionospheric Radio and Propagation

Chair: Prof. Paul Cannon

Vice Chair: Dr. Michael Rietveld

2008 Commission G meeting took place in Chicago, USA, August 11-15.

Commission G Business Meeting 1, (Monday 11 August 2008, 1720 to 1840)

At least 34 were present (34 signed an attendance list)

Paul Cannon presided over the meeting with the following agenda:

- In Memorium and Introduction
- Election of new Commission G Vice-Chair for 2008-2011.
- Terms of reference
- Commission G triennium report by Chair
- Reports by working group chair
- Publications
- Comment on GA 2008 organization and programme
- proposals for session at GA in 2011 (Mike Rietveld)
- Resolutions

1. In Memorium

The business meeting commenced with a brief moment remembering past friends of Commission G:

- Jean-Paul Villain (France)
- A.P. Mitra (India)
- Pietro Dominici (Italy)
- Tor Hagfors (Norway)
- Ludmila Logvinova (Russia)
- Roy Piggott (UK)
- Paul Argo (USA)
- Others known personally

2. Election of new Commission G Vice-Chair for 2008-2011.

Concerning the election for Vice-Chair it was explained

- What the Commission G Vice-Chair duties are.
- Who nominates the Vice-Chair candidates.
- When were the nominations called.
- How many candidates can there be.
- Who votes for Vice-Chair candidates.

To date, 15 postal votes were cast. These and paper ballots from designated international commission delegates were counted by Mike Rietveld (VC) and Christian Hanuise (previous chair)

The candidates:

- Manuel Hernandez Pajares – Spain
- John Mathews – USA
- Jian Wu – China

The first two candidates introduced themselves in a 2-minute statement. Prof. Jian Wu explained in a letter to the Chairman and colleagues of Commission G that he could not attend the meeting due to the problem with obtaining the visa. John Mathews was the successful candidate.

3. URSI Commission G Terms of Reference:

- The Commission deals with the study of the ionosphere in order to provide the broad understanding necessary to support space and ground based on radio systems.
- To achieve the objectives, the Commission cooperates with other Commissions, corresponding bodies of the ICSU family (UIGG, IAU, COSPAR, SCOSTEP, etc.) and other organizations (ITU, IEEE, etc.) Chair report is available on URSI Website.

The terms of reference of Commission G were reviewed and it was decided that no amendment was necessary.

4 Commission G triennial report

Funding to Commission G

- €9000 have administered for the good of the community.
- €4500 was spent in supporting various meetings, typically at the €500 or €1000 level.
- €4500 has been used to support seven scientists, from a number of countries, to attend the general assembly this being the flagship meeting.
- \$500 was also made available to support the attendance of non-US students of the meeting.
- The chair decided to make 5 awards, each of \$1000 to those students who submitted to the Student Paper Competition. Other support was given to different schools, workshops, meetings, sessions, seminars, etc.

Website hosted by URSI

<http://www.URSI.org/G/Homepage.htm>

- Commission G also has an electronic mailing list hosted by Phil Wilkinson (URSI-commission-g@ips.gov.au)
- Chicago GA Programme- 250 papers at the GA. A centralized paper submission process was used.
- Christian Hanuise is the representative to the long range planning committee.
- Young scientists support (long standing)
- New scheme for support of the graduate students outside of the USA.
- Student paper competition.
- Strengthening of the Commissions that are not very active
- New topical initiatives and areas

4b Commission G papers which made it to the 10 finalists of the Student Paper competition:

GEOMETRIC MODULATION: A NEW, MORE EFFECTIVE METHOD OF STEERABLE ELF/VLF WAVE GENERATION WITH CONTINUOUS

HF HEATING OF THE LOWER IONOSPHERE (*Commission G/H/E*), M. B. Cohen, U. S. Inan, Stanford University, Stanford, CA, United States

COORDINATED ANALYSIS OF DELAYED SPRITES WITH HIGH SPEED IMAGES AND REMOTE ELECTROMAGNETIC FIELDS (*Commission E/G/H*), J. Li, S. A. Cummer, Duke University, Durham, NC, United States

DEMETER OBSERVATIONS OF A COLUMN OF INTENSE UPGOING ELF/VLFRADIATION EXCITED BY THE HAARP HF HEATER

(*Commission H/G*), D. Piddychiy¹, U. S. Inan¹, T. F. Bell¹, M. Parrot², N. G. Lehtinen¹, ¹Stanford University, Stanford, CA, United States; ²CNRS, Orleans, France

Commission G has ~250 papers at the GA, an excellent turn out against a background of many other meetings being held this year.

Conclusion

- Commission G is in a pretty good shape
- Vice-Chair election Result
 - John Mathews (USA) has been elected the International Commission G Vice-Chair for 2008-2011
- Concern: Profile of URSI (squeezed by IEEE, COSPAR)

4c New topical initiatives and areas

Canvassed the Commission G National Representatives: Identified important emerging issues in categories of “Applied” Science & Systems and “Pure” Science.

Applied

Radar remote sensing from space and in space,
High integrity GNSS navigation systems, and assimilative models of ionospheric density and
Scintillation, and low frequency astronomy.

Pure

Planetary ionospheres
Anthropogenic effects (ionospheric modification by HF heaters and climate change)
plasmaspheric physics and models

As usual, significant opportunities or interaction exist with Commissions F, H, and J. This should flow through into session choice for 2011

5 Commission G Working Groups and Joint Working Groups

All Working Groups triennium reports were included in the Commission triennium report. These reports are the responsibility of the lead commission representative. A very brief verbal report was provided at the Business Meeting.

- *G.I. Ionosonde Network Advisory Group (INAG)*. Chair: Terence. Bullet (USA), Vice-Chair: Lee-Anne McKinnell (South Africa), INAG Editor: P. Wilkinson (Australia) Recommend continuing with Lee-Anne McKinnell (SA)

replacing Terence Bullet as Chair and Ivan Galkin replacing Lee-Anne McKinnell as Vice- Chair. Will propose a new data exchange format.

- *G.2. Studies of the Ionosphere Using Beacon Satellites.* Chair: R. Leitinger (Austria), Vice-Chairs: J.A. Klobuchar (USA; until October, 2004); P. Doherty (USA, since October, 2004) and P.V.S. Rama Rao (India). Recommend continuing with the same team. R. Leitinger was still unwell after a stroke, but is slowly recovering. The group wants 3 things: Meeting support, Student support for the meeting, and agreement to continue with current leadership.
- *G.3. Incoherent Scatter.* Chair: W. Swartz (USA), Vice-Chair: J.P. Thayer (USA). Recommend continuing with Ingemar Häggström (Sweden) as chair and Mary McCreadie (USA)
- *G.4. Ionospheric Research to Support Radio systems.* Chair: P. Wilkinson (Australia); Co-Chair: M. Angling (UK). Recommend disbanding because of a lack of interest. Reasons were too much overlap with other groups and too much commercial interest.. Some objection was voiced and will be discussed in WG on Thursday– see record of third business meeting.
- *GF. Middle atmosphere.* Co-Chair for Commission G: J. Röttger (Germany), Co-Chair for Com. F: C. H. Liu (China, SRS). Recommend continuing with the same officers.
- *FG: Atmospheric Remote Sensing using Satellite Navigation System.* Co-chair for Commission G: C. Mitchell (UK). Co-Chair for Commission F. Bertram Arbesser-Rastburg. Recommend continuing with the same officers.
- *Inter-commission Working Group on Solar Power Satellite.* Co-Chair for Commission G: M. Rietveld (Norway). Recommends replacing M. Rietveld with someone else.

6. Publications

The Chair, P. Cannon, on behalf of the Commission, thanked Mike Rietveld as the Commission G editor and Vice-Chair for Reviews of Radio Science, for his hard work. Commission G had two reviews and another paper accepted during the triennium which was slightly less than its quota.

Space Weather Impacts of the Subauroral Polarization Streams	<i>Anthea Coster and John Foster</i>	RSB 321, June 2007
The impact of high resolution radar on meteor studies: the EISCAT perspective	<i>Asta Pellinen-Wannberg, Gudmund Wannberg, Johan Kero, Csilla Szasz and Assar Westman</i>	RSB no 324, March 2008.
A collection of papers on ionospheric raytracing to remember the pioneering work of Jennifer Haselgrove.		June 2008 of RSB.

John Mathews will be the Commission G editor for the Radio Science Bulletin. At <http://www.ips.gov.au/IPSHosted/NCRS/reviews> you can find the guides to the style and format used for the Radio Science Bulletin and specifically for the reviews of the RSB, as well as the check list for authors submitting a paper in final form for the bulletin.

7. Discussion on GA 2008 organisation and programme

Submission of abstracts. There was once again a general agreement on having a one-step only submission. People were generally satisfied with the present abstract submission software.

A list of Commission G sessions of the GA 2008 is given in Appendix A.

8. Proposals for sessions in 2011

A call for proposals was made.

Proposed G-related sessions for the next GA 2011 include:

- Radar techniques
- Radio occultation
- Active experiments in plasmas

Proposed HG sessions:

- Modification of the ionosphere and magnetosphere (2 sessions)
- Dusty plasmas
- Electric field antennas in plasmas
- Ionospheric modifications from space
- Ionospheric effects of lightning
- Plasma irregularities and turbulence

Proposed GH sessions

- Radio Sounding Techniques for the Ionosphere and Magnetosphere

Proposed EGH sessions

- Terrestrial and planetary EM disturbances and effects
- Seismo-electromagnetics: lithosphere, atmosphere, ionosphere coupling
- VERSIM – ULF/ELF remote sensing of the ionosphere and magnetosphere

9. Resolutions

- COSPAR endorsed and adopted the new COSPAR International Reference Atmosphere (CIRA 08) **COSPAR further invites**
- URSI to review CIRA 08 during its assembly to be held in August 2008 and to approve and adopt CIRA 08 jointly with COSPAR
- CIRA 08 is anticipated to be published in late 2008 or early 2009 as a special issue of Adv. Space Res.
- The members of CIRA working group will take responsibility for the preparation of the individual chapters of the work, following approved guidelines.

Business Meeting 2: Joint between Commissions G and H

Wednesday, 13 August 2008

Chairs: Paul Cannon (G) and Richard Horne (H)

About 70 people in attendance

Agenda:

- Introduction
- Resolutions from board and impact on Commissions G and H
- Reports by working group chairs
- Commission G and H delegates to committees (updates)
- First discussion on proposals for sessions in 2011 (Mike Rietveld and Yoshi Omura)

2. Resolutions

- To create an inter-commission working group on Natural and Human-Induced Catastrophes and Disasters with the following objectives:
 - To study methods and propose strategies related to Communication systems to set up the time of and after disaster
 - To the use of remote sensing and other data for monitoring and alerting, describing the disturbed environment at the time of disaster and after it
 - To take into account the work of the ITU and other similar bodies
 - To provide support to initiatives taken on natural and human-induced catastrophes and disaster, particularly by developing countries (floods, earthquakes, space weather)

There was a discussion, initiated by Francois Lefeuvre on the usefulness of radio techniques in the areas of floods, earthquakes, space weather. The EGH seismo-e/m working Group, and the Demeter spacecraft are relevant. Richard H and P Cannon will provide inputs.

2. To establish an inter-Commission WG on radio science services (RSS) with the mission:
 - In agreement with the IUSAF, to analyze and if needed, react to ITU recommendations and resolutions that may concern passive and active radio services
 - To inform the URSI commissions regarding the development of new communication systems, and to study with them potential consequences for specific passive and active radioscience services
 - To contribute to inter-union or/and inter-organization activities related to passive and active radio services
3. From the March 2009 issue of the Radio Science Bulletin onwards
 - URSI Radioscientists and officers no longer receive a free copy of the Radio Science Bulletin
 - A limited number of issues will be sent in bulk mailing to the academics (10 copies per dues category)
 - There will only be one such mailing per member committee

- Those who wish to receive a printed version of the Radio Science Bulletin need to pay a subscription fee of 100 Euro per triennium (or 60 Euro on top of the registration fee at an URSI general assembly)
 - Libraries can take a subscription at the current rate of 50 Euro per year
4. It was recommended that URSI forms an inter-Commission Data Committee
- To provide an oversight of URSI data interests
 - To provide an effective interface with other ICSU data communities including overarching groups such as GEOSS (Global Earth Observing System of Systems). And the proposed WDS, and the Committee on Data for Science Technology (CODATA) which URSI recently joined
 - That the initial membership include the current WDC, FASS and ISES representatives, together with representatives proposed by the Commissions
 - That the Data Committee will provide regular reports to the URSI Board and Council and respond to questions from the commissions, the Board and the Council
 - That the Data Committee will develop its own terms of reference and propose these to the Board for further development prior to the next general assembly in 2011

Several people felt this was important, for example to address the problem of long term data storage (Wes Swarz). Amongst others, interested were Dieter Bilitza/ Phil Wilkinson/ Rod Redmon.

3. Working Group Reports

- GH: Active experiments in plasmas - Co-Chairs
 - For commission G: K. Groves (UK)
 - For commission H: Bo Thide (Sweden), Recommend continuing with the same officers
- EGH: Seismo Electromagnetics (Lithosphere-Atmosphere-Ionosphere-Coupling) Co-Chairs
 - For commission G: S. Pulinets (Russia)
 - For commission H: M. Parrot (France), Recommend continuing with the same officers
- Inter-Commission working group on solar power satellites
 - Chair: Hiroshi Matsumoto (Japan)
 - Co-Chair for commission G: M. Rietveld (Norway)
 - Co-Chair for commission H: N. Shinohara (Japan), Recommends replacing M. Rietveld with K. Schlegel (Germany)
- URSI/IAGA VLF/ELF remote sensing of the ionosphere and magnetosphere (VERSIM) Co-Chair
 - For commission H/G: M. Janos Lichtenberger (Hungary), Recommend continuing with the same officers

The working group report appears in the Commission H report

Commission G Business Meeting 3 (Friday, 15 August 2008, 17:20 to 18:30)

Chair Michael Rietveld, vice-chair John Mathews

Approximately 38 people were in attendance.

Agenda

- Introduction by outgoing Chair Paul Cannon
- The next GA, in 2011, will be held in Istanbul, Turkey
- Reports from Working Group business meeting earlier in the week (Wednesday, 13 August 2008)
 - International committee on global navigation satellite systems
- Commission G resolutions
 - Ionosonde data exchange
 - COSPAR international reference Ionosphere
- Commission G: 2011 assembly
 - Commission G tutorial lecture for 2011
 - Sessions for GA 2011
 - Suggested general lectures for 2011
- Publications J. Mathews
- Review of GA 2008
- White papers

1 Opening Comments

The outgoing Chair, Paul Cannon, thanked the Commission for the support they have given to him during his tenure and especially for the assistance given by the incoming Chair, Michael Rietveld. The incoming Chair, Michael Rietveld, then acknowledged the work put by Paul Cannon and thanked him for his efforts and expressed the pleasure he had working with him, as well as expressing his pleasure at being the new Chair. Michael Rietveld then took over chairing the meeting and the Commission.

2 The next GA 2011: Commission G sessions Istanbul (Turkey) has been selected for 2011 general assembly

- Working Group 4 will remain as a working group through the Radio Techniques Conference in Edinburgh next year
-

3 Working Groups

G1: Ionosonde Network Advisory Group

Chair: L-A McKinnell (South Africa), Vice-Chair: Ivan Galkin (USA),
INAG Editor: P. Wilkinson (Australia)

G.2. Studies of the Ionosphere using Beacon Satellites

Chair: R. Leitinger (Austria), Vice-Chairs: P. Doherty (USA), P.V.S. Rama Rao (India) and M Hernandez-Pajares (Spain)

G.3 Incoherent Scatter

Chair: W. I Haggstrom (Sweden), Vice-Chair: Mary McCready (USA)

G.4 Ionospheric Research to Support Radio Systems

Chair: M. Angling (United Kingdom), Vice-Chair: Denis Knepp (USA)

GF Middle Atmosphere

Co-Chair for Commission G: J. Röttger (Germany), Co-Chair for
Commission F: C.H. Liu (China, SRS)

GH1 Active experiments in Space Plasmas

Co-Chair for Commission G: K Groves (USA), Co-Chair for Commission H: B. Thide (Sweden)

URSI-COSPAR on International Reference Ionosphere (IRI)

Chair : B.W. Reinisch (USA), Vice Chair for COSPAR : Martin Friedrich (Austria), Vice Chair for URSI: Lida Triskova (Czech Republic); Secretary: D. Bilitza (USA),

FG: Atmospheric Remote Sensing using Satellite Navigation System

Co-chair for Commission G: C. Mitchell (United Kingdom)

EGH: Seismo Electromagnetics

for Commission G: S. Pulnits (Russia)

Inter-commission Working Group on Solar Power Satellite

Co-Chair for Commission G: K Schlegel (Germany)

URSI/IAGA VLF/ELF remote Sensing of the Ionosphere and Magnetosphere (VERSIM)

Co-Chair for Commission H and G: H.J. Lichtenberger (Hungary)

4 Commission G Resolutions –

The following two resolutions from Commission G were presented, explained and passed unanimously.

Commission G Resolution: CIRA08

Considering

The development of the new COSPAR International Reference Atmosphere (CIRA08)

And the importance of CIRA to URSI Commission G related activities, especially in regard to the International Reference ionosphere (IRI)

Resolves

To encourage COSPAR to continue with the development of the model

(At COSPAR 2008 it was decided to publish CIRA08 as a stand-alone book of Adv. Space Res, with chapters dedicated to:

- four primary models of JB2008, NRLMSISE-00, HWM07, and GRAM-07 developed by AFSPC, NRL, and MSFC respectively,
- energy and momentum inputs from solar, geomagnetic, dynamic and advective sources,
- middle atmosphere composition and structure, especially the minor (metal) species,
- a summary of physics-based and data assimilative models,
- in-progress issues including,
- drag coefficients,
- trends such as thermospheric cooling,
- error analysis,
- appendices including data output examples and reference atmospheres.)

Commission G Resolution: Adoption of a New Ionosonde Data Exchange Format

Considering:

That the capabilities of ionosondes have grown in the last decade.

And that the numbers of new data elements have increased while retaining historical data elements.

And that advances in the state of the art in information technology have occurred which make practical the use of extensible, self defining formats.

And that a new data format, SAO-XML, has been developed, documented, tested and reviewed.

And that the members of the Ionosonde Network Advisory Group (INAG), Commission G Working Group 1 have requested the recognition of SAO-XML as a new standard format for ionosonde data exchange.

Recommends:

That the data format known as SAO-XML be recognized as a format for the exchange of ionogram scaled characteristics and derived data elements from ionosondes.

5 The following topics for the GA 2011 sessions were proposed

- Tutorial topics
 - Satellite missions to observe lightning and gamma-ray flashes
 - ISR modeling
 - Equatorial Plasma Bubbles
 - Solar maximum effects on radio systems

- General Lectures
 - Meteor echoes
 - Sprites, lightning, x-rays

- Sessions
 - Practical applications and techniques for the use of ionosonde data (Lee-Ann McKinnell, Paul Cannon)
 - Distributed observatories for space weather studies (A. Coster, L. McKinnel, P. Doherty)
 - Ionospheric research for Radio Systems Support (I. Stanislawska, H.S. Strangeway)
 - Communications and radar systems (waveforms, frequency management, raytracing), Paul Cannon
 - Irregularities and Scintillations, new measurement techniques and results
 - New Science Initiatives Using Beacon Satellites: Studies over the next few years will increase with the new satellite missions of COSMIC, C/NOFS and others. Perhaps we can consider a session focused on these topics. Proposed chairs: someone from COSMIC and someone from C/NOFS.
 - Measuring and Modeling the Ionospheric Electron Density Profile (D. Bilitza, B. Zolesi, B. Reinisch)
 - CAWSES-2 Ionospheric Campaigns and Results (C. Hanuise and J. Thayer)
 - Coordinated studies with multiple incoherent scatter radars (I. McCrea and A. Strømme). covering radar as well as satellite (Cluster, Themis ...) data sets.
 - Technical developments for incoherent scatter radars (Mike Nicholls and Assar Westman or Ingemar Häggström)

The following sessions with other commissions have been variously proposed:

- GH Ionospheric modification (K. Groves (G) and M. Sulzer or R. Moore suggested (H))
- HG Space-borne sounding and Remote Sensing of Structures in the Plasmasphere (active & passive) (B. Reinisch (G), R. Benson (H)) Planetary, lunar surface, subsurface and ionospheric sounding
- HG Active experiments in Plasmas with Electric Antennas and other means (G. James, V. Sonwalker (H))
- GH Ionospheric effects of Lightning (M. Fullerkrug (G) and U. Inan (H))
- HABCDEFGK Solar power satellites (?)(G), K. Hashimoto (H))
- J/G Ionospheric Calibration for Radio Astronomy ?? ((J) and C. Mitchell (G))
- GHJ Turbulence and vorticity (suggested by B. Thide) ??(G)
- HGE Electromagnetic effects in Lithosphere-Atmosphere-Ionosphere Coupling (S. Pulinets, M. Parrot)
- CFG Radiolocation Covers all aspects (applications, technology) of radiolocation (M. Warrington)
- C/G MIMO at HF (H. Strangeways)

6 Publications

The incoming Vice-Chair, John Mathews was confirmed as the Commission G editor for the new Radio Science Bulletin, incorporating the Review of Radio science. Contributions are requested.

7 Comments on 2008 GA

The General Assembly was considered quite successful for Commission G based on the number and variety of papers and attendance at sessions

Some comments were:

- Paper quantity at registration about right
- Laser pointers really good.
- Bags: some find them unnecessary, others don't
- Print Business meetings time/place in programme
- Poster board size excellent, time scheduled bad (should be >1 day)
- Better web page conference details just before the meeting
- Biscuits, (diet)-softdrinks at coffee breaks
- Wireless microphones needed
- Internet access should be better in conference rooms
- Noisy room (Grand E): Sounds like hotel deliveries and other work behind the partition walls.

8 White Papers

- Solar power satellite (issued)
- Wireless effects on health (being drafted)
- Suggested Commission G -led "Space weather effects on technology" but little enthusiasm from the meeting

Appendix A:

Sessions held at the 2008 General Assembly:

G01: Open Session and Latest Results

- 7 oral plus 20 posters
- *Conveners:* C. Hanuise, A. Coster,

G02: Density Profiling and Models

- 10 oral plus 16 posters
- *Conveners:* B. Reinisch, D. Bilitza, B. Zolesi,

G03: Irregularities and Scintillation

- 11 oral plus 34 posters
- *Conveners:* P. Doherty, A. Bhattacharya, E. de Paula,

HG1a and b: Wave-particle Interactions and Radiation Belt Remediation

- 15 oral plus 11 posters
- *Conveners:* J. Albert, G. Ganguli, K. Groves,

G04a&b: Assimilation and Imaging of the Ionosphere and Plasmasphere

- 12 oral plus 7 posters
- *Conveners:* G. Bust, N. Jakowski, M. Codrescu,

GHE: Modification of the Ionosphere and Magnetosphere

- 7 oral plus 21 posters
- *Conveners:* K. Groves, Y. Ruzhin, M. Kosch, O. A. Molchanov,

FG: Mitigation of Ionospheric and Tropospheric Effects in Precision GNSS.

- 7 oral plus ?? posters
- *Conveners:* B. Arbesser-Rastburg, M. Hernández-Pajares,

GF: Radio Occultation – Techniques, Validation, Science and Applications

- 10 oral plus 4 posters
- *Conveners:* C. Mitchell, C.-H. Liu, T. Schueler,

EGH: Terrestrial and Planetary Electromagnetic Disturbances and Effects

- 10 Oral plus posters
- *Conveners:* M. Hayakawa, C. Price, M. Füllekrug,

GH: Radio Sounding Techniques for the Ionosphere and Magnetosphere.

- 11 oral plus 7 posters
- *Conveners:* L.-A. McKinnell, G. James,

HG2: Dusty Plasmas

- 6 oral plus 4 posters
- *Conveners:* M. Rosenberg, P. Bernhardt,

JG: Low Frequency Radio Astronomy and the Ionosphere

- 6 oral plus posters
- *Conveners:* G. de Bruyn, P. Rao, B. Junor, <bjunor@lanl.gov

G05a&b and c: Radar Studies I

- 21 oral plus 30 posters
- *Conveners:* W. Swartz, M. Lester, J. Chau,

HGE: Seismo-electromagnetics

- 10 oral plus 27 posters
- *Conveners:* M. Parrot, S. Pulinets, O. Molchanov,

G06: Improving Radio Systems through Ionospheric Radio Science

- 7 oral plus 8 posters
- *Conveners:* M. J. Angling, C. Coleman, A. Bourdillon,

HBDGJK: Solar Power Satellites

- 7 oral plus 4 posters

– *Conveners:* K. Hashimoto, R. Dhillon, W. van Driel, R. J. Pogorzelski