

**IAGA, the International Association of Geomagnetism and Aeronomy,** is the premier international scientific association promoting the study of terrestrial and planetary magnetism and space physics

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## Foreword



In just a few months, thousands of Earth and space scientists will gather in Montreal for the International Union of Geodesy and Geophysics (IUGG) General Assembly, where they will present their research and participate in networking activities. What makes this IUGG meeting such an amazing and inspiring event. And, in this frame, the event will

be a great opportunity for IAGA scientists.

First, there is the science. You will have access to cutting-edge research on topics from Earth's core, through the upper atmosphere and magnetosphere, to the Sun.

Then, comes the global nature of our science. The IAGA membership is far broader and the research presented will have global implications. Our success will depend on our talent to make connections and share information across borders and oceans.

Next, there is a variety in career stage. Students networking with the professors or early-career scientists sharing the stage with honored scientists — these scenarios will be again during the IUGG General Assembly.

Finally, in 2019 IUGG celebrates its centenary and geomagnetism is one of the oldest geoscience disciplines, which has been of constant scientific interest for the IUGG ever since its formation. Together we will celebrate the 100<sup>th</sup> anniversary of international cooperation in Earth and Space sciences!

I look forward to seeing as many of you as are able to attend in Montreal next summer.

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This issue of IAGA News contains information about the IAGA activities over the year 2018, This issue also contains reports on IAGA activities of different kinds and provides information about recently deceased IAGA scientists. In its present form, IAGA News contains only brief summaries of different activities and topics; the reader is referred to the nicely IAGA website ([www.iaga-aiga.org](http://www.iaga-aiga.org)) for more details. Information on activities at Division level can be found on each Division's website.

IAGA News is distributed – in its electronic form – to the

National Correspondents in the Member Countries, to all IAGA officers and to scientists who have attended recent IAGA assemblies. Please feel free to distribute IAGA news around, especially to national policy makers and leaders, whose decisions can affect the activities of IAGA scientists.

Mioara Mandea  
(Secretary-General)

## 1 Message from the President

Dear friends and colleagues, dear Geomagnetists and Aeronomers. This is my last end-of-year address in the role of the IAGA President. It has been my great pleasure and honour to act in this role and I have to say that sometimes the challenges have been rather unexpected, yielding very useful personal experience. This year was without our Assembly; nevertheless, it was very busy. Again, I had the opportunity to attend some of the topical, IAGA-sponsored meetings. The first one, a must for me, was the 16<sup>th</sup> "Castle Meeting" on Paleo, Rock and Environmental Magnetism, which was excellently organised by our Polish colleagues in Chenciny near Cracow. A high portion of young researchers (about 30% out of some 90 participants), their excellent performance, a summer school for students organised in the preceding days, these have already become a tradition. The other meeting I attended was the 24<sup>th</sup> Electromagnetic Induction Workshop in Helsingor, Denmark. It was my first time at this meeting and I am happy to say that the event was great from the point of view of scientific excellence and the general workshop and family-like atmosphere. With respect to the latter meeting, I have to say that this electromagnetic community, which recently formed Division VI of IAGA, is very active, with an excellent organization and management structure, its own statutes and by-laws and electronic voting.



This year we were actively preparing the IAGA and IUGG Assembly scientific program. Big thanks are to Mioara Mandea, our member of the Scientific Program Committee, who is frequently communicating all the issues with the EC members and Division leaders. The program is available, registration and abstract submission is open, and I would like to motivate everybody to attend this event in the beautiful Canadian city of Montreal. With respect to the IAGA activities related to this Assembly, I have to mention that the Chair of our Interdivisional Commission on Education and Outreach Edgar Bering took active lead in the preparation of the GIFT workshop for teachers as well as the IAGA School for PhD students. Although at present he continues only with the GIFT Workshop, I would like to acknowledge all he had done with respect to

the IAGA School. Organization of this event will be managed by Monika Korte and Andrew Yau, and I am very grateful for their volunteering work. I am confident that the School will be again successful, attracting new promising young researchers, introducing them to the wide range of IAGA-related research.



Eduard Petrovsky presenting the certificates to students for excellent presentation and the 16<sup>th</sup> Castle Meeting on Paleo, Rock and Environmental Magnetism

Next year we (and the whole IUGG) celebrate our 100 years anniversary. In addition to the IUGG Assembly, there will be many other opportunities to celebrate this nicely rounded number. Probably the most important will be an "IAGA Book" entitled "Geomagnetism, Aeronomy and Space Weather: A Journey from the Earth's Core to the Sun" (edited by Mioara Mandea, Monika Korte, Andrew Yau and myself). This is almost ready and will be published by the Cambridge University Press. This work, with contributions written by top world researchers in geomagnetism, aeronomy (upper atmospheric and ionospheric physics) and space weather, is an insiders' view of advances in these research fields in recent years, while also serving as a go-to reference on current and emerging research in these fields, for specialists and non-specialists alike. Many thanks go to all the contributors.

At the end let me to thank a lot to all those joining me in this term and service, namely our Secretary General Mioara Mandea, Vice-President Monika Korte, and all the members of the Executive Committee as well as the leaders of individual bodies of IAGA. Discussing and exchanging the thoughts with them has always been very useful and positive.

To conclude, my term will end at the Assembly in Montreal. However, I will continue to serve IAGA to the best of my abilities in the future, either as a member of the IAGA Executive Committee, or in the role of an active researcher. I am confident that the new President and Executive Committee will endure and further foster the role and significance of IAGA, both within and outside IUGG.

Best regards and see you all in Montreal.

Eduard Petrovsky  
(President)

## 2 Preparation for the 27<sup>th</sup> IUGG General Assembly

For the 27<sup>th</sup> IUGG General Assembly the route is to Canada!

This General Assembly is a special opportunity for participants from around the world to come together and share their science and culture. 2019 marks the 100<sup>th</sup> anniversary of IUGG.

This meeting will offer the possibility to look back on the accomplishments of the previous century of Earth and space science research, and forward to the next century of scientific advancement. In conjunction with the IUGG General Assembly, a number of scientific and cultural events are planned. IAGA is proud to announce the organisation of the 4<sup>th</sup> IAGA school!

The meeting will bring many occasions for scientists to discuss a wide range of topics, over breaks, poster sessions, and the IAGA special dinner party!

### Time and Place

The 27<sup>th</sup> IUGG General Assembly will be held July 8-18, 2019 at the Palais des Congrès in Montréal,

Québec, Canada.

**Local Organising Committee** The Local Organising Committee (LOC) comprises of a mix of early career scientists as well as established researchers in all Earth's disciplines.

The Local Organising Committee (LOC) is chaired by Fiona Darbyshire.

### Key dates

|              |  |
|--------------|--|
| 1 Oct 2018:  | Registration Opens                                   |
| 18 Feb 2019: | Deadline for Submission and Travel Grant Application |
| 30 Mar 2019: | Notification of Acceptance                           |
| 5 Apr 2019:  | Early-bird registration Deadline                     |
| 31 May 2019: | Complete scientific program details published        |

### More information

Detailed information on programme, abstract submission, registration, accommodation, venue are provided:

<http://iugg2019montreal.com/>

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## 3 The 4<sup>th</sup> IAGA School

The 4<sup>th</sup> IAGA School will be held on July 3-7, 2019, on the eve of the upcoming IUGG General Assembly. It will be at University of Montreal's Station de biologie des Laurentides, a Research Station located at about 80 km north of Montreal, Canada: <https://sbl.umontreal.ca/accueil/>.

As its predecessors at Merida, Mexico; Prague, Czech Republic, and Cape Town, South Africa, respectively, the 4<sup>th</sup> IAGA School aims at providing excellent early career scientists (mainly PhD

students) with a good basic understanding of a wide range of the scientific topics covered by IAGA.

IAGA will be selecting about 24 early career scientists to attend the School, from nominations by the Chairs and Co-Chairs of the 6 IAGA Divisions and their Working Groups. IAGA will sponsor their accommodation and cost of living while attending the school. The selection will be made early in the New Year.

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## 4 Executive Committee activities

Over 2018, the Secretary General organised 5 teleconferences. The Executive Committee members participated in all of them. During these meetings the agendas covered normal working

items, but focussed mainly on the following topics:

- *The IAGA Book for the IUGG 100<sup>th</sup>*

*Anniversary.* The book "Geomagnetism, Aeronomy and Space Weather: A Journey from the Earth's Core to the Sun" has 5 parts, each consisting of multiple chapters. Two EC members have been in charge of each part. At the end of 2018 the book is in the editing process with Cambridge University Press.

- *IGA involvements in the IUGG 100<sup>th</sup> An-*

*niversary celebration.* To highlight the history of IAGA a contribution has been made by Mioara Manda and Eduard Petrovsky.

- *IUGG 2019.* The discussions were mainly centered on different steps in consolidating the Union and IAGA scientific sessions
- *IAGA School.* The 4<sup>th</sup> IAGA School will be held at the Université de Montréal Station de Biologie on July 3-7 2019.

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## 5 IAGA Resolutions - 2017

These resolutions were adopted during the IAPSO - IAMAS - IAGA joint Assembly, Cape Town, August / September 2017.

**Resolution No.1 (2017): Magnetic satellite mission constellation** The International Association of Geomagnetism and Aeronomy (IAGA)

### *Considering*

- the interests of the scientific community in observing with the highest accuracy and resolution the numerous components of the Earth's magnetic field to investigate the fundamental processes and hazards affecting the Earth system, from the deep Earth to space
- that the Earth's magnetic field is one of the fundamental global change variables of our planet

### *Acknowledging*

- the extensive expertise acquired within the international scientific community in analysing data from dedicated Low Earth Orbiting magnetic satellite missions like Oersted, CHAMP and Swarm continuously over the last 20 years, and the considerable success of these missions
- Stressing the need for permanent long-term measurement of the magnetic field for understanding its generation, forecasting its evolution, and for space weather applications
- the possibility of further enhancing the sci-

ence return and the technological applications of the on-going Swarm constellation by considering the addition of new satellites, such as nanosatellites

### *Urges*

- international and national institutions, agencies and governmental bodies in charge of supporting Earth and space science research to make all efforts to extend support for current missions and to catalyse and implement new magnetic field satellite missions that would respond to the aforementioned need for continued and improved observation.

**Resolution n° 1 (2017): Constellation de mission satellite pour la mesure du champ magnétique**

### *Considérant*

- l'intérêt de la communauté scientifique pour l'observation à haute précision et résolution des nombreuses composantes du champ magnétique terrestre pour l'investigation des processus fondamentaux et des risques pouvant affecter le système terrestre, de la Terre profonde à l'espace,
- que le champ magnétique terrestre est l'une des variables globales fondamentales de notre planète,

### **Reconnaissance**

- la vaste expertise acquise par la communauté scientifique internationale dans l'analyse des données magnétiques mesurées depuis l'espace grâce aux missions satellitaires navigant en orbites basses telles que Oersted, CHAMP et Swarm au cours des 20 dernières années, et le succès considérable de ces missions Soulignant
- la nécessité de réaliser des mesures permanentes du champ géomagnétique sur le long terme afin comprendre son origine, prévoir son évolution et pour les applications liées à la météorologie spatiale,
- la possibilité d'améliorer les avancées scientifiques et les applications technologiques de la constellation Swarm actuellement en orbite en envisageant le lancement de nouveaux satellites, tels que des nanosatellites,

### **Demande instamment**

- aux institutions internationales et nationales, aux agences et aux organismes gouvernementaux chargés de soutenir la recherche en sciences spatiales et terrestres, de tout mettre en œuvre pour apporter un soutien aux missions actuelles, pour catalyser et pour mettre en œuvre de nouvelles missions satellites mesurant le champ géomagnétique afin de répondre aux besoins susmentionnés et de poursuivre et d'améliorer les observations.

**Resolution No.2 (2017): USGS Geomagnetism Program and Magnetic Observatories** The International Association of Geomagnetism and Aeronomy (IAGA)

### **Considering**

- the value of continuity in high-quality, ground-based magnetic observations to increase our knowledge of Earth dynamics and space weather,
- the importance of such observations and related research in monitoring, modeling and forecasting extreme space weather events that could potentially disrupt the world,

- the critical importance of such observations in developing global reference models such as the International Geomagnetic Reference Field, used in navigation (airborne, marine), satellite orientation, directional drilling and numerous other applications,

### **Noting**

- that the United States presidential budget for Fiscal Year 2018 has proposed to eliminate the USGS Geomagnetism program,
- that most countries with advanced economies support an observational, research-based geomagnetism program,

### **Urges**

- the United States government to continue funding permanent, ground-based magnetic observations in the United States and its territories, as well as observation-based research in geomagnetism.

## **Résolution n° 2 (2017): Programme USGS sur le géomagnétisme et les observatoires magnétiques**

### **Considérant**

- l'importance de la continuité des observations à haute précision du champ géomagnétique pour l'approfondissement des connaissances sur la dynamique de la Terre et en météorologie spatiale,
- l'importance de telles observations et des recherches connexes pour la surveillance, la modélisation et la prévision d'événements météorologiques extrêmes pouvant potentiellement perturber le monde,
- l'importance cruciale de ces observations pour le développement de modèles mondiaux de référence tels que le modèle de champ géomagnétique international, utilisé dans la navigation (aéroportée, marine), l'orientation des satellites, le forage terrestre orienté et de nombreuses autres applications,

### **Notant**

- que le budget présidentiel des États-Unis pour l'exercice 2018 a proposé d'éliminer le programme en géomagnétisme de l'USGS,
- que la plupart des pays dont l'économie est avancée soutient un programme de recherche basé sur l'observation et l'étude du géomagnétisme,

### **Demande instamment**

- au gouvernement des États-Unis de continuer à financer les observations permanentes du champ magnétique sur le sol des États-Unis et dans ses territoires, ainsi que la recherche en géomagnétisme.

**Resolution No.3 (2017): Resolution of thanks** IAGA, noting the successful scientific outcomes, organisation and excellent atmosphere of the IAPSO-IAMAS-IAGA Joint Scientific Assembly in Cape Town, and appreciating the enor-

mous amount of work required to organise the meeting expresses its deep gratitude to the members of the Local Organising Committee and the staff, led by Isabelle Ansoerge, for their hard work and unfailing courtesy, helpfulness, enthusiasm and energy, which have made the Assembly a great success.

### **Résolution n° 3 (2017): résolution de remerciement**

IAGA, notant les résultats scientifiques positifs, l'organisation et l'excellente atmosphère de l'Assemblée scientifique conjointe IAPSO-IAMAS-IAGA qui s'est tenu en la ville du Cap, et appréciant le travail considérable réalisé pour organiser la réunion, exprime sa profonde gratitude aux membres du comité d'organisation local ainsi qu'au personnel, dirigé par Isabelle Ansoerge, pour leur travail acharné, leur courtoisie sans faille, leur gentillesse, leur enthousiasme et leur énergie qui ont fait de cette Assemblée un grand succès.

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## **6 Swarm mission – probing the geomagnetic field**

Five years into operations since its launch in 22 November 2013, the Swarm constellation is providing excellent measurements of the Earth's magnetic field and associated plasma environment. In November 2017, the mission was granted a four year extension to 2021. The user community is achieving unprecedented scientific results and exploring new applications.

All three-satellite platforms are performing very well, essentially free of any anomalies, and the space segment constellation orbit geometry evolves in line with expectation. With regards to the payloads, the main technical and scientific challenges are the limited availability of high-quality accelerometer data from Alpha and Bravo, the search for optimised (near-continuous) operations scenarios for the Thermal Ion Imagers and the search for the optimal understanding of the optical bench performance for magnetometry and attitude observations. Expert groups constantly work and meet to discuss the resolution of these issues, providing essential support for the ver-

ification and validation of all data products, as well as the enhancement of processing algorithms. Specific investigations also involve dedicated attitude manoeuvres and hardware setting modifications.

With an astonishing number of publications covering a broad spectrum of scientific subjects from Earth's core evolution to small-scale high-energy and dynamic ionosphere events, the three-satellite constellation promises to further unveil new discoveries during its future years of mission exploitation. The upcoming programmatic decision will focus on the Swarm mission extension and on the specific management of the constellation orbit evolution to optimise the scientific return of the mission.

The important 2018 Swarm-related meeting 8<sup>th</sup> Data Quality Workshop was hosted by the ESA Centre for Earth Observation (ESRIN), Frascati, Italy, from 08 to 12 October 2018. Presentations of the 8<sup>th</sup> Swarm Data Quality Workshop can be

## 7 Reports on Meetings: IAGA-Sponsored or of IAGA interest

### 7.1 The IUA Symposium 340 Workshop 2018

**Jaipur, India , 18-24 February 2018**

IAU Symposium 340 on “Long term datasets for the understanding of solar and stellar magnetic cycles” was held in Jaipur, India – February 18 - 24, 2018. This symposium brought together scientists from diverse, interdisciplinary areas such as solar, stellar, space and heliospheric physics to review the status of the different long-term datasets available across the globe. The symposium provided an excellent platform to exchange ideas on the understanding of solar long-term behavior, its effects and prediction. The Kodaikanal Observatory has observed the sun at wavelengths White light, Ca-II K and H-alpha since 1904. The digitization process has been completed recently and raw and calibrated data was made available to the global community through an announcement during the meeting.

A total number of 233 registered participants attended the symposium, with 157 male and 69 female candidates from 26 different countries across the globe.

There were eight sessions with 25 invited talks and 46 contributed presentations. There were 153 poster presentations and dedicated poster sessions were allotted for each day. Each session also attracted poster awards for young scientists. All the presentations are posted in the website <https://www.iiap.res.in/iaus340/?q=Home>

Scientific highlights IAU Symposium 340 enabled a comparison of recent results from a wide variety of scientific disciplines, which includes

- Helio/asteroseismology long-term data: solar/stellar interior velocity fields – Status, divergence, and challenges
- Long term magnetic field measurements in the sun and stars

- Sunspot number datasets: status, divergences, and unification
- Solar total irradiance and spectral irradiance long-term data: status, divergences, and challenges
- Solar cycle database of solar activity: variations in solar eruptions (flares, CMEs, SEPs, etc.)
- Long-term monitoring of stellar activity: lessons for the solar cycle
- The variable solar wind and the heliosphere
- Solar behavior over centuries using radioisotopes
- Physical causes of the solar/stellar cycle irregularities
- From past to future: predicting upcoming solar cycle 25

There were several education and outreach programs conducted during the conference, including a visit for the conference delegates to the Jantar Mantar, a world heritage site. There were workshops organized for the tourist guides with the theme of understanding the usage of the historical observatory instruments through Positional Astronomy observations. A full day workshop on computer based data analysis on long-term solar data sets was also organized for undergraduate and graduate students on the last day of the conference. 90 students attended this workshop. Prof. Nat Gopalswamy also delivered a public lecture titled “Our life-giving star, the Sun and its dark side”.

IAGA has provided USD 1000 financial support for the IAU Symposium 340. This amount was utilized to support some young students with local hospitality. Scientific organizing committee of the IAU Symposium 340 selected Mr. Sushant

Mahajan for the nomination of IAGA Young scientist award for best presentation. [https://www.iiap.res.in/iaus340/?q=awards\\_recognitions](https://www.iiap.res.in/iaus340/?q=awards_recognitions)

The proceedings of the IAUS 340 will be published by CUP and in the final stages of printing.

We are planning to have a School organized in 2019 as a follow up of this IAU Symposium.

Dipankar Banerjee  
On behalf of the Organizing Committee

## 7.2 The 8<sup>th</sup> Workshop on VLF/ELF Remote Sensing of Ionospheres and Magnetospheres (VERSIM)

Apatity, Russia, 19-23 March, 2018



The 8<sup>th</sup> biennial Workshop on VLF/ELF Remote Sensing of Ionospheres and Magnetospheres (VERSIM) was held on 19-23 March 2018 in Apatity (Murmansk region, Russia). The conference was hosted by the Polar Geophysical Institute (PGI). The meeting web site is at <http://pgi.ru/conf/versim2018>.

The workshop was attended by 42 participants with the following countries of affiliation: Russia (19)(including 6 from PGI), Finland (5), Japan (5), Hungary (5), Czech Republic (3), USA (3), France (1), UK (1).

In total, 64 abstracts were accepted. Of those, 10 were canceled after acceptance for various reasons. Finally, 50 oral and 4 poster reports were presented. Each oral talk was given a 20-min

time slot, including invited reports. Posters were also briefly (5 min each) presented during a single time slot. The following session themes were identified, being held in a sequence:

- D-region phenomena and propagation in the Earth-ionosphere cavity;
- Wave propagation in E and F regions;
- ELF and VLF waves related to lightning discharges;
- New instruments and results of specific measurements;
- Magnetospheric ELF/VLF phenomena;

- Radiation belt dynamics (not only related to ELF/VLF waves);
- Laboratory modeling of cyclotron wave-particle interactions.

The radiation belt session was included in the program following the successful experience of the 7<sup>th</sup> VERSIM workshop.

In the order of their presentation, a number of specific highlights were identified from the given talks which included:

- Measurements of VLF wave propagation at long and short distances and advanced numerical modeling allow one to improve characterization of D-region disturbances and location of wave exit areas from the magnetosphere.
- ELF/VLF activity produced by thunderstorm discharges is related to the discharge type.
- Theoretical modeling of VLF wave propagation and absorption explains U-shape spectra observed by DEMETER mission.
- Advanced data analysis methods, such as neural network approach, make it possible to dig new findings out of large data bases.
- New observations of VLF auroral hiss reveal correlations with geomagnetic storm activity.
- Similarity between properties of quasi-periodic VLF emissions and ELF equatorial noise was revealed.
- Transformer saturation due to geomagnetically induced currents may be diagnosed by VLF measurements.
- Novel conjugate ground-spacecraft observations of various types of VLF emissions
- Advanced use of whistlers and man-made signals observed onboard a spacecraft for diagnosing the magnetospheric plasma density.
- Radiation belt codes rely upon empirical models of wave activity, and existing models still do not yield satisfactory operation of the codes when compared with real data.

- Laboratory experiments on resonant wave-particle interactions have reached a remarkable success in confirming basic physical features.

Both local, regional, and federal media paid attention to the meeting. An article was published in an [Apatity newspaper 2x2](#) (online version). An interview about the conference and its science topics was [broadcasted over Murmansk region on 27 March](#) (from 26m55s to 34m55s). The same commentary was [broadcasted over federal Mayak radio](#).

An overview of the workshop will be placed and kept at the web page (<http://pgi.ru/conf/versim2018>), including the final program, the electronic abstract collection, the group photo, and links to press releases.

According to IAGA recommendations and usual VERSIM practice, we have organized a competition between the young scientists eligible as candidates for the IAGA Young Scientist Award, “in order to identify outstanding and promising persons whose research, presentation and overall performance at the topical meeting meet high international standards and represent big potential for the future of IAGA.” Six eligible candidates attended the meeting. Their talks were identified to the audience before being presented, and the science committee members were collecting their impressions. After the conference, there was a discussion among the science committee followed by a voting. All reports were rated as very good or excellent. The winner, Dr. Evgenii Shirokov (IAP RAS, Nizhny Novgorod, Russia) was declared during the VERSIM business meeting held on Friday, 23 March.

The next workshop will be held in 2020, according to the biennial scheme. During the business meeting on 23 March 2018, the participants encouraged Prof. Yoshiharu Omura to organize the VERSIM-2020 workshop in Japan, in accordance with his proposal.

Boris Kozelov  
On behalf of the Local Organizing Committee

### 7.3 The 10<sup>th</sup> Workshop on Long-term Changes and Trends in the Atmosphere

Hefei, China, 14-18 May 2018

The 10<sup>th</sup> Workshop on Long-Term Changes and Trends in the Atmosphere was held at Hefei, China on May 14-18 2018.



There are about 130 participants from 13 countries and regions of China, Germany, USA, Japan, Taiwan, Argentina, Czech Republic, Finland, Russia, Malaysia, India, UK, Australia, including many graduate students and young scientists. This highly successful meeting is the most attended in this trend workshop series with over 120 abstracts received.

The six traditional sessions include trends and variability in the troposphere, stratosphere, mesosphere, thermosphere, ionosphere and modeling trends. In addition, three tutorials for students and young scientists were given on the history of trend researches, dynamics and modeling. Jan Lastovicka gave a special seminar on how to publish in scientific journals for early career scientists.

A special joint issue of Journal of Geophysical Research Space Physics and Journal of Geophysical Research Atmosphere is planned. The host institute of the next trend workshop is TBD. Nearly all pdfs of the oral presentations will be available at:the webpage: <http://trends2018.ustc.edu.cn/programs.html>

Tao Li, Jia Yue  
On behalf of the Local Organizing Committee

### 7.4 Coronal and Interplanetary Shocks: Data Analysis from SOHO, Wind, and e-CALLISTO Data

Mekelle, Ethiopia, May 21 - June 2, 2018

The workshop was organized by Mekelle University in collaboration with COSPAR, SCOSTEP, ISWI to introduce a system that can help to understand space and ground based data to explore and expand research practice on interplanetary shocks. The workshop objectives were:

- Encourage the scientific use of space data by scientists in developing countries,
- provide a highly practical training in the use of space data from current missions,
- space-based coronagraph observations (SOHO, STEREO, SDO, Wind) and radio spectral observations from space (Wind/WAVES, STEREO/WAVES) and ground (RSTN, CALLISTO) to study shocks driven by coronal mass ejections.



Workshop in Mekelle, Ethiopia consisted of trainees from Ethiopia (15), Egypt, India, Kenya, Nigeria, Rwanda, Tunisia, Sri Lanka, Nepal (17) and Lecturers (11): Ethiopia, USA, Greece, India, Italy, Switzerland total of 43 participants.

The workshop was conducted at Axum Hotel where students and lecturers were settled for the two weeks workshop time. The workshop was conducted from May 21 - June 2, 2018. There was a strong support from Mekelle University management. It was opened by the President of the University Prof. Kindeya G/hiwot.

Some Comments from the Participants • "This is really a major part of true intellectual culture of modern times" • "Everything was fine in the hotel except network connectivity." • "Uploading

the lectures on workshop website, well before the workshop was helpful.” • “ I have learned a lot during the project by taking measurement from the observations and analysing them to understand the CMEs I worked on.” • “This is by far the most beneficial training/workshop in regards to the relevance to my field of study and adequate time to practice with what is learnt. The interactions were invaluable. The software were relevant.” • “This workshop helped me a lot . . . I have no words to express my happiness . . . But I want to recommend to continue this workshop every year.”

Based on the comments given from the participants and our observation as a University the workshop was very much successful and achieved its goals.

Gebregiorgis Abraha  
On behalf of the Local Organizing Committee

## 7.5 16<sup>th</sup> Castle Meetings Workshop

Chęciny Poland, June 10 - 16, 2018



The biennial Castle meetings “New Trends on Paleo, Rock and Environmental Magnetism” are important scientific events in the international scientific community of palaeo- rock and environmental magnetists. They are being organized already for 30 years as the platform fostering scientific exchange between researchers from different generations consisting of recognized experts to young PhD (or even master) students. They are well balanced to combine scientific work with social programme and the space for informal discussion at a reasonable cost.

The 16<sup>th</sup> edition of the Castle meeting was held at the European Centre for Geological Education

(ECEG) at Chęciny, Poland from the 10<sup>th</sup> to the 16<sup>th</sup> of June 2018. It was organized as a joint effort of the Institute of Geophysics Polish Academy of Sciences and the Faculty of Geology University of Warsaw, the owner of ECEG. In total, 75 participants from 20 countries from four continents participated actively and gave 78 conference presentations (49 oral, 29 posters), with 19 Master / PhD student contributions. The scientific programme was partitioned into plenary sessions consisting of 8 to 10 oral presentations, two poster sessions with accompanying flash presentation, and sufficient time for poster viewing. The book of abstracts was prepared as the volume of the “Publications of the Institute of Geophysics, Polish Academy of Sciences” Vol 423, Series: C-112, doi: 10.25171/InstGeoph\_PAS\_Publs-2018-084.

During conference five invited talks were presented. Ann Hirt (ETH Zurich, Switzerland) reviewed rock magnetic techniques applied to environmental, material, and life sciences and Mark Dekkers (Utrecht University, the Netherlands) presented the magnetic field intensity record in wide time range in quaternary lava-flows. Krzysztof Michalski (Institute of Geophysics PAS, Poland) presented the issues of conducting of palaeomagnetic studies in the High Arctic. Two speakers – Frantisek Hroudka (AGICO and Charles University, Czech Republic) and Bernard Henry (Institut de Physique du Globe de Paris, France) reviewed the aspects of AMS methods – tectonic applications and new approaches to AMS measurement methods.

In addition to the scientific programme, the social programme started with a trip to Raj carst cave and a night performance at Chęciny medieval castle. During the full day excursion UNESCO heritage list places were visited: with the walk in the Cracow Old Town and sightseeing of Wieliczka Salt Mine ended with a group dinner at the salt mine chamber at the depth of 130 m. On the last day the meeting was completed in the Tokarnia open air ethnographic museum. During the short closing ceremony in line of the long lasting tradition to encourage the students’ integration into the international scientific community and to promote early career scientists research achievements five awards for outstanding student presentations were given.

Awards were handed to: Tomasz Gonet (Lancaster, Great Britain), Katarzyna Dudzisz (Warsaw, Poland), Annemarieke Beguin (Utrecht, the Netherlands), Joy Muraszko (Cambridge, Great Britain), Barbara Leśniak (Zurich, Switzerland). Tomasz Gonet from Lancaster University was nominated for the IAGA Young Student Award for his presentations entitled “Magnetic properties of brake wear emissions - preliminary results” and “Assessment of topsoil contamination near the Stanisław Siedlecki Polish Polar Station in Hornsund, Svalbard, using magnetic methods”.

The pre-meeting short course (7<sup>th</sup>-10<sup>th</sup> June, 2018) was focused on the rock magnetism applied to structural geology. In the course nine early career scientists from Poland, France/ the Netherlands, Brazil/Pakistan, Italy, Germany, Switzerland/China and Great Britain were enrolled. The field work and laboratory training at ECEG paleomagnetic laboratory were combined with lectures of AMS and rock magnetism. The team of instructors included Ann Hirt (ETH, Zurich). Mark Dekkers (Utrecht University), Frantisek Hroudá (Brno, Czech Republic), Piotr Ziólkowski (ECEG, Poland), Tomasz Werner (IG PAS, Poland).

The prosperity of the 16<sup>th</sup> Castle Meeting owes also a lot to the generous support of Centre for Polar Studies (Poland) and Institute of Geophysics PAS directed to the invited speakers and conference materials, the International Association of Geomagnetism and Aeronomy (IAGA), and the following partners: AGICO s.r.o.(Brno, Czech Republic) and Magnetic Measurements Ltd. (Aughton, UK). I would like to thank both organizing teams from Institute of Geophysics PAS and Warsaw University (with Piotr Ziólkowski, leader of ECEG) for their long lasting efforts before and during conference.

It was decided by voting that the next, 17<sup>th</sup> edition of the Castle Meetings will be held in Croatia in 2020. We are looking forward to the next fruitful and successful meeting in two years.

Tomasz Werner  
On behalf of the Local Organizing Committee

## 7.6 XVIII<sup>th</sup> IAGA Workshop on Geomagnetic Observatory Instruments, Data Acquisition and Processing

**Conrad Observatory, Austria, June 21-29, 2018**

The XVIII<sup>th</sup> IAGA Workshop on Geomagnetic Observatory Instruments, Data Acquisition and Processing took place at the Conrad Observatory of the Zentralanstalt für Meteorologie und Geodynamik (ZAMG), Austria from 21<sup>st</sup> June to 29<sup>th</sup> June 2018 (<http://cobs.zamg.ac.at/iaga2018/>).



The IAGA workshops focus was on observatory instruments and techniques, data acquisition and processing, observatory infrastructure, magnetic repeat stations and applications of observatory data.

The IAGA workshop itself from 24<sup>th</sup> to 29<sup>th</sup> June 2018 had the main tasks of the observatory instruments intercomparison measurements; instrument functionality, scientific talks and poster sessions.

The Local Organization Committee, tried to avoid overlapping of the different activities, the poster session lasted the whole week. Therefore, it was possible to do the measurements also during the poster sessions.

The event attracted 110 participants from 36 different countries from all over the world. There were made 123 DI measurements by 32 different observers on four pillars at the tunnel system of the Conrad Observatory. In total 39 oral presentations were given and 35 posters were presented. Alan Thomson from the British Geological Survey gave an invited talk during the opening ceremony. Beside the poster sessions, an excursion to a winery and BBQ evening provided also an excellent opportunity for the geomagnetic research community for discussions about the latest research findings, new development work, methods and measurement procedures.

IAGA Observatory Summer School was organized

in the days before the IAGA Workshop for the first time, with the aim of providing young technicians and scientists as well as new observers with a good basic understanding of a wide range of observatory topics. The school provided an in-depth course on DI measurements, instrumentation and data processing with accompanying practical sessions given by experts in the specific fields.

DI measurements: Alan Berarducci, U.S. Geological Survey, Instrumentation: Tim White, U.S. Geological Survey, Data processing: Chris Turbitt, British Geological Survey.

Roman Leonhardt and  
Barbara Leichter  
On behalf of the Local Organizing Committee

## 7.7 7<sup>th</sup> IAGA/ICMA/SCOSTEP Workshop on Vertical Coupling in the Atmosphere-Ionosphere System

Potsdam, Germany, July 2-6, 2018



The traditional 7<sup>th</sup> IAGA/ICMA/SCOSTEP Workshop on Vertical Coupling in the Atmosphere-Ionosphere System was held in the campus of the GFZ German Research Centre for Geosciences, Helmholtz Centre Potsdam from July 2 – 6, 2018. Audience at the Workshop included 60 scientists from 30 institutions across 18 countries spanning Asia, Europe, Africa, North and South America. During five days of the workshop over 50 oral contributions were presented, among them 5 solicited and 16 posters. [Abstracts and the Workshop program are available online.](#)

This traditional meeting brought together research experts from the lower, middle and upper neutral atmosphere, ionosphere and magnetosphere communities in order to present their

recent work and assess/debate ongoing issues relating to the theoretical, modelling and observational aspects of all kind of processes which transfer energy and momentum from the lower atmosphere to the upper atmosphere and ionosphere and vice versa. Since the last meeting in Taipei in 2016, considerable progress has been achieved in observing and quantifying variability throughout the atmosphere-ionosphere system driven by dynamical coupling, as well as identifying their respective driving mechanisms. Special attention has been paid to the middle atmosphere phenomena from both theoretical and experimental sides. Atmospheric waves and their crucial role in the atmosphere system at all time scales have been largely discussed.

This workshop proposed an excellent opportunity for the research communities to interact in a supplementary manner in reviewing and debating the progress done to date in the field of the atmosphere-ionosphere in the all height span and come up with suggestions and ideas for further research on the vertical coupling of the neutral atmosphere and ionosphere with the extension to the magnetosphere system. Communication between scientists from atmospheric, ionospheric and space physics has been very fruitful and initiated discussions and further cooperation. I would like to point out high attendance of young scientists with excellent contributions.

Participants agreed on the necessity for a detailed review of recent findings, and also initiated planning for a special edition of the *Annales Geophysicae*, to be submitted by the end of December 2018.

The Organizing Committee would like to acknowledge financial support from the International Association of Geomagnetism and Aeronomy (IAGA), the International Union of Geodesy and Geophysics (IUGG) and SCOSTEP VarSITI. Here, I would like to emphasize two outstanding presentations of young scientist Cornelius Csar Jude Salinas dedicated to "Local-time Variations of Low Latitude Lower Thermospheric SABER CO<sub>2</sub> during Equinoctial Solar Minimum" and "Solar Cycle Response of CO<sub>2</sub> over the Austral Winter Mesosphere and Lower Thermosphere Region" and Friederike Lilienthal entitled "Numerical simulation of wavenumber 3 tidal forcing mechanisms". On behalf of Scientific Organiz-

ing Committee, I would suggest the IAGA EC to consider these two young scientists for the nomination of IAGA award for the participation in the forthcoming IUGG 2019.

Petra Koucká Knížová  
Chair of the Scientific Organizing Committee  
and  
Christina Arras  
Chair of the Local Organizing Committee

## 7.8 14<sup>th</sup> Quadrennial Solar-Terrestrial Physics Symposium

**Toronto, Canada, July 9-13, 2018**



SCOSTEP's 14<sup>th</sup> Quadrennial Solar-Terrestrial Physics Symposium (STP14) was held during July 9-13, 2018, at York University, Toronto, Canada. SCOSTEP is engaged in three major activities: long-term scientific programs, capacity building and public outreach. The scientific programs are of interdisciplinary nature and are designed to advance our understanding of the solar-terrestrial relationship using space- and ground-based observations, cutting-edge models and theory. The underlying theme of these programs is the way the Sun affects the Earth over various time-scales. SCOSTEP's current scientific program, VarSITI (Variability of the Sun and Its Terrestrial Impact) expands the solar-terrestrial physics into the broader context of star-planet interaction to further our understanding of Sun-Earth connection.

The Symposium gathered 150 scientists from 26 countries, Austria, Brazil, Bulgaria, Canada, China, the Czech Republic, Finland, France, Germany, Georgia, Greece, Hungary, India, Italy, Japan, Korea, New Zealand, Nigeria, Norway, Poland, Russia, Spain, Switzerland, Taiwan, the UK, and the USA, to discuss the detailed relationships of the Earth to the Sun. The event

was sponsored by the Centre for Research in Earth and Space Science (CRESS), with support from the Lassonde School of Engineering (LSE) of York University; SCOSTEP; the USA's National Science Foundation; the Core-to-Core Program of the Japan Society for the Promotion of Science; the Project for Solar-Terrestrial Environment Predictions, Japan, and the International Association of Geomagnetism and Aeronomy (IAGA). All sponsors have been acknowledged in the Abstracts Book, on the STP14 website (<http://www.scostepevents.ca/>) and in all printed materials associated with the conference, e.g. posters, Newsletters.

The program included 120 oral presentations and 39 posters organized in 14 sessions with 4 keynote speakers, 25 invited speakers and 8 plenary speakers. Keynote presentations were given by David Kendall (UNCOPUOS, Canada), Larry Paxton (Johns Hopkins University, Atmospheric Physics Laboratory, USA), Irina Mironova (St. Petersburg State University, Russia), and Spiro Antiochos (NASA/GSFC, USA). The Symposium program, Abstracts book and the presentations can be found on line at the [STP14 website](#). A special journal issue based on the STP14 presentations will be published in due course.

The location of the 15<sup>th</sup> Quadrennial Solar-Terrestrial Physics Symposium, to be held in 2022 is still to be determined.

Marianna G. Shepherd  
Scientific Secretary, SCOSTEP

## 7.9 COSPAR 42<sup>nd</sup> Scientific Assembly

**Pasadena, CA USA, July 14-22, 2018**

COSPAR 2018 was held in Pasadena, CA USA from 14 to 22 July. The hosts and supporting organizations for the 42<sup>nd</sup> Assembly were Caltech and the Jet Propulsion Laboratory (JPL). The venue for the Assembly was the Pasadena Convention Center.

According to figures supplied by ZARM, the service provider which processes abstracts, maintains the Assembly website, and compiles the program book and abstract CD, 4285 abstracts were submitted by approximately 3920 authors for the 131 events comprising the core Pasadena scientific program. Event organizers accepted

4265 abstracts, of which 372 were withdrawn, leaving 3893 (2844 oral presentations and 1049 posters). In addition to the core scientific program of 131 scientific events, participants could attend six interdisciplinary lectures, a presentation of the COSPAR roadmap on small satellites for space science currently under preparation, scientific round tables organized by the COSPAR Panel on Exploration (PEX) and the COSPAR Panel on Space Weather (PSW) and a roundtable discussion to mark COSPAR's 60<sup>th</sup> anniversary, involving three COSPAR Presidents which addressed the continuing evolution and perspectives of COSPAR in its role serving the international space research community. Participants and the general public were also invited to attend a lecture entitled "Mapping the Nearest Stars for Habitable Worlds." See below for details of these lectures.

According to preliminary figures supplied by the Local Organizing Committee (LOC) at the time this report was prepared, a total of 2770 scientists, students, exhibitors, and press participated in the 2018 Assembly. This figure is composed as follows: 2273 full participants, 419 students, 58 exhibitors, and 20 representatives of the press. In addition, 40 participated as accompanying persons. The total number of participants including representatives of sponsors, volunteers, staff, etc. was 3218.

The inauguration of the Assembly consisted of an entire afternoon and evening of activities during which there were no scientific sessions. The inaugural activities began with the Latest Results session which highlighted some recent, outstanding results through a series of four 20 minute presentations and was followed by a space agency roundtable addressing from the perspective of international collaboration the topics of: climate change and required space observations, observations required for the forecasting of space weather, planetary exploration, and opportunities for the use of small satellites for space research.

These events were followed by the opening and awards ceremonies. Speakers at the former were Larry James, Deputy Director of the Jet Propulsion Laboratory; Tom Rosenbaum, President Caltech; Jerry Brown, Governor of California; Terry Tornek, Mayor of Pasadena; Nelson Pedreiro, head of Lockheed Martin's advanced technology center; and Len Fisk, COSPAR President. After

the opening speeches, COSPAR and joint awards were presented.

A total of 341.5 half-day sessions was needed to accommodate the 131 events making up the core of the scientific program. The numbers, titles, organizers, and descriptions of the 2018 Assembly events were listed in the Call for Papers issue of this bulletin (August 2017).

COSPAR 60<sup>th</sup> Anniversary Roundtable involved two past COSPAR Presidents, Professors Gerhard Haerendel and Roger-Maurice Bonnet, the current COSPAR President Professor Lennard A. Fisk, and moderated by Athena Coustenis. The discussion addressed the continuing evolution and perspectives of COSPAR in its role serving the international space research community.

Aaron Janofsky  
COSPAR Associate Director

## 7.10 The 24<sup>th</sup> Electromagnetic Induction Workshop

**Helsingør, Denmark, August 3-20, 2018**

The 24<sup>th</sup> Electromagnetic Induction Workshop (EMIW) was held in Helsingør, Denmark, from 13 - 20 August 2018. The venue was located at the Kulturværftet (Culture Yard), an old shipbuilding yard, which in 2010 was transformed into a modern cultural centre, including concert halls for up to 500 visitors, showrooms, conference facilities, a dockyard museum, a public library, and a restaurant. The Danish King Eric of Pomerania founded Helsingør in 1420. He established the Sound Dues in 1429, meaning all foreign ships passing through the strait had to pay a toll, which constituted up to two-thirds of Denmark's state income. With this income, Eric of Pomerania built the castle Kronborg. The castle was expanded in the 1580s and renamed Kronborg. It is now known to famously feature in Shakespeare's play "Hamlet".

The workshop is held every two years in different countries under the auspices of the IUGG and IAGA Division VI - Electromagnetic Induction in the Earth and Planetary Bodies. Having the 24<sup>th</sup> workshop means that we have so far enjoyed 46 years of knowledge sharing, exchanging and debating ideas, inspiring the young, admiring the old, and farewell to the legends. The Helsingør

workshop continued previous tradition of a collegiate atmosphere with one concurrent session. A one-day excursion in the middle of the workshop allowed a glimpse at Danish history with visits to a Viking museum, castles and amusement parks.

For the 24<sup>th</sup> workshop, we had 302 participants from 38 countries joining the workshop. Among these were 188 delegates, 94 students, 6 retired scientists and 14 accompanying persons. There was a total of 345 abstracts submitted in which 54 abstracts were selected by the Workshop Program Committee for oral presentations. All posters were on display for the entire week of workshop allowing the delegates a chance to see the posters during the poster sessions, but also in their own time. The abstracts and extended abstracts including the review manuscripts were available to the participants of the workshop via the web site of the conference (<https://emiw2018.emiw.org/>). In addition, session descriptions and reviewer bibliographies, program schedules including excursion details are available from the Program Book available via our official website.

Similar to previous workshops, we had provided significant financial support for a number of participants who contributed to the workshop but had insufficient funds to cover their travel and participation costs. Unfortunately, not all applicants could be supported as resources were limited; decisions were made by the Financial Support Committee of IAGA Division VI. Priority was given to (i) applicants authoring a presentation (either oral or poster), (ii) students and post-docs/junior scientists since they typically have less access to other sources of funding, and (iii) applicants, who have not received funding at previous workshops.

Stephan Thiel  
On behalf of the Organizing Committee

### **7.11 The XVI<sup>th</sup> Hvar Astrophysical Colloquium "International Study of Earth-affecting Solar Transients ISEST 2018 Workshop"**

**Hvar, Croatia, September 24-28, 2018**

The XVI<sup>th</sup> Hvar Astrophysical Colloquium "International Study of Earth-affecting Solar Transients ISEST 2018 Workshop" was held on 24-28

September, 2018 in Hvar, Croatia. The Colloquium continued the series of conferences organized since 1982 and represents the most important solar physics event in Croatia. This workshop directly addresses the scientific goals of the VarSITI project - The International Study of Earth-Affecting Solar Transients (ISEST), which is one of the four projects of SCOSTEP's VarSITI program (2014-2018). The ultimate goal of the ISEST project is to develop the capability to predict the arrival and geoeffectiveness and other space-weather consequences of solar transients.

The XVI<sup>th</sup> Hvar Astrophysical Colloquium was attended by 75 scientists (including 19 students) from 19 countries: Austria: 18, USA: 11, Croatia: 8, Russian Federation: 7, China: 5, Germany: 5, Belgium: 4, Czech Republic: 2, Greece: 2, Poland: 2, United Kingdom: 2, Bulgaria: 1, Denmark: 1, Finland: 1, France: 1, Hungary: 1, India: 1, Italy: 1, Switzerland: 1.

At the meeting 11 invited talks, 32 contributed talks and 13 ISEST WG reports, as well as 32 posters were presented during sessions entitled: ISEST WG reports, Data & Observation related to solar-terrestrial phenomena (WG1-data, WG5-Bs challenge and related abstracts from the General session on Sun & Heliosphere), Simulations and theoretical aspects of solar-terrestrial phenomena (WG2-theory, WG3-simulation and related abstracts from the General session on Sun & Heliosphere), Parker Solar Probe and Solar Orbiter, Solar energetic particles (WG6-SEPs and related abstracts from the General session on Sun & Heliosphere), Event studies using solar-terrestrial data & modeling (WG4-campaign events and related abstracts from the General session on Sun & Heliosphere).

The ISEST project, involving a truly global network of scientists, consists of seven active working groups: (1) Data, (2) Theory, (3) Simulation, (4) Event campaign, (5) Bs challenge, (6) Solar Energetic Particles, and (7) MiniMax campaign. The project provides a standing website for hosting event catalogs, data and presentations and offers a forum for discussion available at <http://solar.gmu.edu/heliophysics>. Basic scientific questions addressed are how do CMEs and CIRs propagate and evolve, drive shocks, and accelerate energetic particles in the heliosphere. Observational, theoretical, and modelling aspects

of these questions were addressed at the workshop.

The next Hvar Astrophysical Colloquium will be held in 2020.

Domagoj Ruzdjak On behalf of the Organizing Committee

## 7.12 The 15<sup>th</sup> International Symposium on Equatorial Aeronomy (ISEA-15)

Ahmedabad, India, October 22 – 26, 2018



The 15<sup>th</sup> International Symposium on Equatorial Aeronomy (ISEA-15) was hosted by the Physical Research Laboratory (PRL), Ahmedabad, India during October 22 – 26, 2018. ISEAs are held once in 3 to 4 years and bring together global scientists involved in research on various aspects of low- and equatorial latitudinal regions of upper atmosphere. The 3<sup>rd</sup> ISEA meeting was held in 1969 at PRL under the leadership of Prof. Vikram Sarabhai, considered the father of the Indian Space program and the founder of PRL. As a prelude to his birth centenary year celebrations beginning next year, PRL and India got a second opportunity to host the prestigious ISEA.

ISEA is a 5-day long single session symposium with no parallel sessions, and this approach provides a clear advantage in terms of sharing the new findings with a wider audience. There were seven scientific themes in ISEA-15, namely (1) Equatorial E- and F-region irregularities: Cause and effects, (2) Longitudinal dependence of equatorial electrodynamic, (3) Mesosphere, Ionosphere, Thermosphere coupling at low- and mid-latitudes, (4) Mid- and low-latitude effects of global atmospheric wave coupling, (5) Space weather effects on low- and mid-latitudes, (6) Results from new techniques, experiments, and campaigns, and (7) Future trends, opportunities, and challenges in low-latitude aeronomy. In all, 249 abstracts were received. Sixty-four oral talks were presented and all the posters were displayed

on all the days which provided time for extended interactions. There were around 180 participants from 22 countries, with over 60 participants from countries other than India. There has been a significant participation from young scientists in this ISEA. A few topics on which new results were presented include formation of counter electrojet during geomagnetic quiet times, diurnal modulation of 150-km echoes, estimation of equatorial vertical drifts, influence of interplanetary electric fields on the equatorial electrodynamic, propagation of gravity wave and traveling atmospheric dynamics, formation of thermospheric structure during geomagnetic storms, modulations in total electronic content due to space weather effects, mesospheric temperature inversion and effect on upper atmosphere due to stratospheric sudden warming. New results from recent satellite missions were also presented. It is planned to have the results from ISEA-15 published in a special issue of peer reviewed journal.

A young scientist presentation award competition was held wherein 43 young scientists (under the age of 30 years) participated. An international panel of scientists evaluated all the 51 presentations from these young scientists (both oral and posters) and selected Dr. Deepak Kumar Karan, a Post-Doctoral Fellow from Physical Research Laboratory, Ahmedabad, India for nomination to IAGA's Young Scientist Award.

A panel discussion was held in the last session and important outcomes from this symposium and future course of directions were discussed. We record our gratefulness to the main sponsor, the Indian Space Research Organization (ISRO), and the co-sponsors, viz., International Association of Geomagnetism and Aeronomy (IAGA), National Science Foundation (NSF), International Center for Theoretical Physics (ICTP), VarSITI (Variability of the Sun and Its Terrestrial Impact) program of Scientific Committee on Solar Terrestrial Physics (SCOSTEP), Committee on Space Research (COSPAR), and National Aeronautics and Space Administration (NASA). This support enabled participation of several researchers from developing nations. More information about the program, abstracts and other updates are available on the ISEA-15 website <https://www.prl.res.in/isea15>.

Duggirala Pallamraju  
On behalf of Local and Scientific Organizing Committees

## 7.13 75 Years of Geomagnetic Measurements in Romania

**Bucurest, Romania, October 16-19, 2018**

The fundamental goal of the fourth Round Table and Workshop on Geomagnetic Measurements held in Bucharest and Surlari Observatory was the exchange of experience related to practical and theoretical problems associated with observations of the natural geomagnetic field at geomagnetic observatories and their applications. The event, organized by the Geological Institute of Romania on October 16-19, 2018, celebrated 75 years of geomagnetic measurements in a historical year which marks 100 years since its Great Union, hugely important to Romania and Romanian identity. The main topics of the Round Table and Workshop have been divided in two parts: a scientific session and a measurement session consisting in DI measurements settled on the main pier of Absolute Measurement Lab in Surlari (SUA).

The sessions were attended by approximately 60 participants coming mainly from Romania and from four countries outside. Inspiring keynote addresses that shaped the conversation were given by Prof. Dr. HDR Mioara Manda from Centre National d'Etudes Spatiales, France, Secre-

tary General of IAGA, Christopher Turbitt and Simon Flower from British Geological Survey, UK, INTERMAGNET Operations Committee officers as well as Dr. Hans-Joachim Linthe, GeoforschungsZentrum, former head of Niemeck Observatory, Germany.

There were nearly 20 papers presented and the intent was to stimulate participant discussions in aim of the exchange of information and experience related to the methodology of geomagnetic observations. The subjects of the presentations covered the following research areas: Magnetic Observatories: from compass to flux-gate epoch; From deep core to space: long term and short term variations of geomagnetic field; Magnetic Observatories and Satellites: a needed synergy to characterize the geomagnetic field; Magnetism and our world: from current to future applications. The selected presentations at the meeting will be considered for publication in a special issue of the Romanian Geophysical Journal a Romanian Academy publication.

The Organizing Committee would like to acknowledge the support of the invited speakers, as representatives of IAGA and INTERMAGNET organizations.

Anca Isac  
Chair of the Organizing Committee

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## 8 In Memorium

**Fr. Luis Felipe Alberca Silva (1929 - 2017)**

With great sadness we announce the passing of Fr. Luis Felipe Alberca Silva. The Ebro Observatory sympathizes with his family and with the Society of Jesus for his loss. We will always remember his teaching and his unconditional service to the Ebro Observatory, the Ramon Llull University, and the scientific community.



Dr. Alberca was born in August 1930. He got his MsD in Physics in 1958 and his PhD in 1977 at the Universitat de Barcelona. He started to work at the Ebro Observatory in 1968 and was contributing to it up to his very last days with the service of rapid magnetic variations of IAGA. He was director of the Ebro Observatory from 1985 to 2001. He also worked for the "Junta de Energía Nuclear" (1959-1960).

Dr. Alberca contributed to important results in the study and monitoring of the ionosphere during the late 1960 to 2000s. These were related to total electron content (TEC) and D region radio absorption studies. In 1964 NASA launched the Explorer 22 satellite and later provided recording equipment for Faraday rotation TEC mea-

measurements at Ebro Observatory. In the following years, data from satellites Syncon III, Intelsat II-F3, ATS-F, SIRIO, and INTASAT were also recorded and used. Daily and seasonal behavior of TEC, and solar activity influence on TEC were obtained and assessed; it was found that in general, the winter anomaly does not exist in the TEC recorded at Ebro Observatory. A combination of TEC and vertical incidence soundings allowed for studies of the ionospheric slab thickness and some other parameters such as neutral temperature, scale height, and integrated electron production rate for vertical and grazing incidence were also deduced. Even today these are significant contributions to modeling of slab thickness and scale height behavior. In 1967 collaboration between Ebro Observatory and the Max-Planck Institut für Aeronomie in Lindau, Germany began, in order to establish a network of radio absorption measurements covering the Iberian Peninsula, that were based on the A3 method. As a result of this joint effort, the winter anomaly of the D region was assessed, and these studies were complemented by measurements of temperature, composition, and wind velocity at D and E region heights by means of rocket launches.

During the 1980s there was a noticeable lack of ionospheric research at the Ebro Observatory, probably because of economic difficulties. However, during the late 80s and early 90s new international collaborations started with the efforts of Dr. Alberca and the Ebro Observatory succeeded in continuing its tasks. Participation of the Ebro Observatory first in the EUROCAP project in 1987 and afterwards in the European COST actions 238 and 251, thanks to Dr. Alberca's efforts, was crucial for the internationalization of Ebro Observatory. During these years, it was discovered that a hysteresis variation of the foF2 with sunspot cycle was related to a semi-annual geomagnetic wave, and a model for its prediction was proposed. Also, the variability of the ionospheric F region, caused by planetary wave signatures and its relationship to mesosphere/lower thermosphere winds and geomagnetic activity variations, has been extensively investigated. Dr. Alberca also contributed to study of the electric field and conductivity measurements of the stratosphere, with two high-altitude balloon flights between Italy and Spain in 1989 and 1990. The high altitudes of these

flights, 35 and 38 km, allowed us an opportunity to explore the electrical parameters of the upper stratosphere at midlatitudes and to extend the validity of earlier models from 28 km to nearly 40 km.

His death is a great loss for the ionospheric physics community worldwide.

David Altadill  
IObservatori de l'Ebre, Roquetes, Spain

## Eigil Friis-Christensen (1944–2018)



Eigil Friis-Christensen passed away on 21<sup>st</sup> September 2018 after severe illness.

Eigil had tremendous impact as a scientific leader, working tirelessly throughout his career to promote interdisciplinary approaches and international collaboration. His scientific achievements include

ground-breaking studies of the interaction between Earth's magnetic field and the solar wind, in particular using data from the Greenland magnetometer chain that he initiated and installed in the 1970s; the Oersted and Swarm satellite missions to explore Earth's magnetic field, and investigations of the connection between global temperature and the length of the solar cycle.

He was highly regarded and recognized internationally for his many achievements. To list just a few: In 1997 he initiated the "Decade of Geopotential Field Research" within the IUGG, between 2007 and 2011 he served as president of IAGA, in 2009 he was awarded EGU's Petrus Peregrinus Medal for "his fundamental contributions to our knowledge of the Earth's magnetic field from space and his innovative leadership in geomagnetism" and also was elected a fellow of the AGU for "his pathbreaking cross-disciplinary scientific research and multi-national leadership in initiating new space-based research missions".

Eigil's quiet and kind personality, combined with his dedication to science and his ability to inspire

his younger colleagues and promote their individual careers, will be remembered by all who had the privilege to work with him.

We have lost an outstanding scientist and a remarkable person.

Nils Olsen and Chris Finlay  
DTU Space - Technical University of Denmark

## John T. “Jack” Gosling (1938–2018)

Dr. John T. “Jack” Gosling died 10 May 2018, in Louisville, Colo., after a battle with cancer. With his passing, the field of space physics lost one of its most insightful, productive, and influential scientists, and many of us have lost a dear and treasured friend.

Born 10 July 1938, in Akron, Ohio, Jack was a 1956 graduate of Buchtel High School. In 1965 Jack received his Ph.D. from the University of California, Berkeley. His thesis, guided by Robert Brown, addressed the production of energetic X-rays by charged particle precipitation from the magnetosphere. To collect data for his studies, Jack built instruments that flew on high-altitude balloons near Fairbanks, Alaska.



From 1965 to 1967 Jack was a postdoc at the Los Alamos Scientific Laboratory (now Los Alamos National Laboratory), where he explored data from plasma instruments on the Los Alamos Vela series of satellites. These studies produced some of the earliest evidence of solar wind structure as the cause of the sudden commencements and impulses of geomagnetic storms. His studies also demonstrated the significant variability in the locations of both the magnetopause and bow shock and the association of that variability with solar wind dynamic pressure.

Following his postdoctoral studies, Jack worked for 8 years at the High Altitude Observatory in Boulder, Colo. He focused on observations of solar wind structure and dynamics, including characterization of the magnetic structures of inter-

planetary coronal mass ejections and the evolution of solar wind stream structure. His studies involved both in situ solar wind data and white light coronagraph observations from Skylab. In 1975 Jack returned as a staff member to Los Alamos where he worked in various subfields of space physics. For 30 highly productive years, he studied the solar wind and Earth's bow shock and magnetopause. He worked with data from the International Sun-Earth Explorer (ISEE) 1, 2, and 3 satellites. Eventually, he worked with data from later satellites, including the Advanced Composition Explorer (ACE) and Wind. Upon his retirement from Los Alamos in 2005, he took an appointment at the Laboratory for Atmospheric and Space Physics of the University of Colorado. Jack was a prolific scientist, authoring or co-authoring more than 450 refereed papers. His work was extremely influential: A citation analysis of his work shows an h-index of 89, and his work has been cited more than 27,000 times in more than 13,000 separate articles. In addition to this and many other seminal contributions to understanding the structure and dynamics of the corona and solar wind, Jack was at the forefront of research into fundamental plasma processes, including collisionless shocks and magnetic reconnection. He led studies on the internal structure of Earth's bow shock and its role in the acceleration of energetic particles. His work on reconnection elucidated the connection between energetic particles and flows resulting from the changing topology in regions as diverse as coronal mass ejections, Earth's magnetopause, and the large-scale solar wind plasma.

Jack also had a keen sense of duty to community service. He was a member of numerous committees and panels for the National Science Foundation, NASA, the National Oceanic and Atmospheric Administration, and the American Geophysical Union and as a valued reviewer for several scientific journals. He received the editor's citation for excellence in refereeing three times from the Journal of Geophysical Research, twice from Geophysical Research Letters, and once from Reviews of Geophysics. To support undergraduate and graduate students in solar-terrestrial and space plasma physics, in 2014 Jack endowed a fellowship at the University of Colorado that has already provided fellowships to eight students. Jack's scientific contributions were widely recog-

nized. He was a fellow of Los Alamos National Laboratory, of AGU, and of the American Association for the Advancement of Science. He received AGU's John Adam Fleming Medal in 2000 and the National Academy of Sciences' Arctowski Medal in 2013. He presented the Parker Lecture at AGU's Fall Meeting 2004.

More than just an excellent scientist, Jack was a model and mentor for numerous postdocs and younger colleagues. All who had the privilege of working with him will attest to the integrity and honesty he brought to his personal research and his collaborations. Any manuscript given to him for comment would come back to the author covered in colored ink. This process (widely known as "Goslation") was painful but always immensely helpful. There was no doubt that when an author accepted Jack's comments and wording suggestions, a manuscript would be very much clearer, tighter, and better. He was always insistent that the most important question a scientist could ask is "So what?" This insistence on significance was a hallmark of his own work and of his influence on the work of others.

Jack married Marie Turner in 1963; they had two sons, Mark and Steve. Marie died in 1990, and in 1994 Jack married Judy Hughes. Jack and Judy's blended family now boasts eight grandchildren. Jack's many personal and professional friends knew him to be intelligent, thoughtful, loyal, and funny, with an abiding love for doing science. He will be greatly missed.

Daniel Baker  
Laboratory for Atmospheric and Space Physics, University of  
Colorado Boulder; USA  
William Feldman  
Planetary Science Institute, Tucson, Ariz., USA  
David McComas  
Department of Astrophysical Sciences, Princeton University,  
Princeton, N.J.; USA  
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Laboratory for Atmospheric and Space Physics, University of  
Colorado Boulder; Michelle Thomsen, Planetary Science Institute,  
Tucson, Ariz, USA.

### Karl Rawer (1913 – 2018)

It is with great sadness that we report the passing of Prof. Karl Rawer at his home in March, Germany two days before his 105<sup>th</sup> birthday. He died peacefully during his afternoon nap with the book that he was reading on his lap. Prof. Rawer was one of the pioneers of the exploration of

the ionosphere from the ground and from space, and in the understanding of radiowave propagation in the ionospheric medium. He leaves a rich legacy and large body of work in ionospheric and atmospheric physics, including his book "Die Ionosphäre" published in 1952 and translated into several languages. He received many honors and was the Director of the Fraunhofer Institute for Space Research in Freiburg, Germany and the project scientist of the first German-US Aeronomy Satellites, AEROS-A and AEROS-B.



Karl Rawer was born on April 19, 1913 in Neunkirchen, Germany and studied mathematics and physics under Gustav Mie and Gustav Dötsch in Freiburg, and under Arnold Sommerfeld and Jonathan Zenneck in München. In his dis-

sertation in 1939 he used hyperbolic and Epstein functions to solve for the first time the problem of radio wave propagation in a stratified medium, and from then on he was hooked to ionospheric research. During World War II he was charged with developing ionospheric predictions in support of HF communications, working with Johannes Plendl and Walter Dieminger. After the war he was invited to establish an ionospheric prediction service in what was then occupied Germany's "French Zone". He developed close ties with his French counterparts and was the first German after the war to be invited to lecture at the Sorbonne University (Prof. Associé 1958-1960, and Prof. d'Échange 1961-1964). After first working under the auspices of the French Service Prévision Ionosphérique de la Marine (SPIM), Rawer in 1956 established the "Ionosphäreninstitut" in Breisach, Germany and served as its director from 1956 to 1969. This institute gained international reputation in the field of ionospheric radio wave propagation and forecasting, and the development of ionosondes in cooperation with research organizations in the USA and France, and joint measuring campaigns in Italy, Greece, Norway, and Africa. Throughout his career Prof. Rawer was a strong proponent of international science cooperation recognizing its potential to

build bridges after the horrible war years and to foster international peace. The International Geophysical Year (IGY) 1957/58 was the perfect opportunity and, representing Germany, he participated in many of the activities. Together with Roy Piggott in the U.K. he published the "Handbook for the Scaling of Ionograms" a precious reference book that is a must at every ionosonde station worldwide. In 1966 Rower was elected Vice-Chair of Commission G of the International Union of Radio Science (URSI) and served as Vice-Chair and then Chair until 1972. At the 2017 URSI GASS in Montreal, Canada the "Karl Rower Gold Medal", a medal in honor of the work and life of Professor Karl Rower, was awarded for the first time. The recipient, Dieter Bilitza, had the opportunity to visit Prof. Rower in March, Germany in September 2017 to show him the first Rower Gold Medal.

A new chapter in Prof. Rower's scientific career began with the first successful launch of the newly developed French "Veronique" rocket from Hammaguir (Algeria) in the Sahara Desert in 1954. With scientific payloads developed under his leadership ionospheric conditions were observed in situ along the rocket trajectory showing for the first time the steep increase in electron density in the D-region. Many more launches followed and with his expertise in instrument development and mission management Rower played a key role in the German involvement in the beginnings of space exploration. When the Committee on Space Research (COSPAR) was founded in 1958 for the promotion of scientific research at an international level, Rower actively participated and in 1964 became the Chairman of the German National Committee of COSPAR. He vigorously exploited the opportunity that COSPAR offered to establish long lasting relationships between scientists from West and East across the cold war borders, but also with researchers in India and in hitherto neglected countries in the Far East and Africa. With a focus on his new area of interest Rower, in cooperation with the Fraunhofer Society, founded the Institute für Physikalische Weltraumforschung (IPW) in Freiburg and served as its director from 1969 to 1979. Under Rower's leadership the IPW became a focal point of space exploration in Germany and was responsible for Germany's second and third satellites, the AERonomy Satellites AEROS-A and

AEROS-B that were launched in 1972 and 1974, respectively. The EUV spectrometer, impedance probe, and retarding potential analyzer for these missions were developed and tested in-house. Together with the US Atmosphere Explorer C, D, E satellites, the AEROS-A and -B satellites were one of the first to provide a global view of the ionosphere and upper atmosphere and led to a much improved understanding of the processes that shape this region of geospace.

Data from the AEROS satellites together with measurements from the worldwide network of ionosondes were the foundation for the International Reference Ionosphere (IRI), a project that Prof. Rower initiated under the auspices of COSPAR and URSI. He chaired the IRI Working Group from 1968 to 1976 and continued his active involvement into the mid-1990s. Under his guidance and leadership, the IRI project took off on a path that has led it to become the recognized international standard for the ionosphere that it is today. As participants of the bi-annual IRI Workshops we will always remember Rower's scientific rigor and endurance that kept us on our seats and engaged in spirited discussions till late in the day, and his joy and happiness during the social events with a good glass of wine and dancing late into the evening. The Final Discussion session at the end of the Workshop was his trademark with setting out goals for improvements of the model and finding volunteers to accomplish these tasks.

Since 1955, Prof. Rower had been affiliated with the Albert-Ludwigs-Universität of Freiburg, lecturing and advising graduate and doctoral students. Even when extremely busy with his many national and international science projects, he always had an open door and ear for his students and mentored their careers long past their final exams. His research activities in ionospheric modeling continued after his retirement with support from the German Research Foundation (DFG) and ESA's European Satellite Operations Center (ESOC). In 1993 he published the book "Wave Propagation in the Ionosphere".

Rower's greatest love and pride (and maybe one of the secrets of his longevity) was his large family with two sons, four daughters, 19 grandchildren, and 31 great-grandchildren.

On the occasion of Prof. Rower's 100<sup>th</sup> birthday (see photo), Bodo Reinisch had delivered a lau-

dition at the German URSI National Committee meeting on his life and accomplishments: *Adv. Radio Sci.*, 12, 221-223, 2014, [www.adv-radio-sci.net/12/221/2014/](http://www.adv-radio-sci.net/12/221/2014/).

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(former student of Prof. Rawer)  
and Dieter Bilitza, George Mason University, USA.  
dbilitza@GMU.edu  
(former student of Prof. Rawer)

## Don Farley (1933 – 2018)



Don Farley, pioneer of incoherent scatter radar theory, world leader in ionospheric research, and inspiring teacher and mentor, died peacefully in Ithaca, NY, on May 13, 2018, at the age of 84.

Don attended the College of Engineering at Cornell University under a full athletic scholarship, running for the track and cross-country teams. After receiving his B.Eng. Phys. and Ph.D. degrees from Cornell, Don spent a year at Cambridge University as a NATO Postdoctoral Fellow, a year as Docent at Chalmers University in Sweden, and then six years in Peru at the Jicamarca Radio Observatory, three of them as director, before returning to the U.S. where he joined the Cornell faculty as a full professor in 1967. He returned to Sweden in 1985 for a year as the Tage Erlander Visiting Professor at the Uppsala Ionospheric Observatory and was, in 1995, the Von Humboldt Senior Scientist at the Max-Planck Institute für Aeronomie in Katlenberg-Lindau. Between 1979 and 2003, he was the Principal Investigator for the NSF award supporting research at Jicamarca. Don was the J. Preston Levis Professor of Engineering in Electrical and Computer Engineering at Cornell before becoming Professor Emeritus in 2006.

Don was a pioneer in radio and space physics. His Ph.D. work considered how electrostatic fields vary along geomagnetic field lines. His best-known early-career work, however, focused on the

development of incoherent scatter theory, the theory of radio wave scattering from thermal density fluctuations in ionospheric plasmas. Incoherent scatter would become the most incisive tool we have for studying ionospheric plasmas from the ground. Don developed not only the theory but also the methods for ionospheric research with incoherent scatter at emerging facilities such as the Arecibo Radio Telescope in Puerto Rico and at the Jicamarca Radio Observatory in Peru, especially, where the effects of the earth's magnetic field require special attention. Working at Jicamarca, Don also discovered the class of electrojet plasma waves and instabilities known now also to exist at middle and high latitudes and that now bear his name. Don developed important new methods in radio science including radar interferometry which plays a key role not only in ionospheric research but also in radar studies of the mesosphere, stratosphere, and troposphere (MST).

Don was a Fellow of the Institute of Electrical and Electronics Engineers and a member of the American Geophysical Union, the International Scientific Radio Union (URSI), and the American Association for the Advancement of Science. He received U.S. Department of Commerce Distinguished Authorship awards in 1963 and 1964 as well as the U.S. Department of Commerce Gold Medal in 1967. He was awarded the 1996 URSI Sir Edward Appleton Prize, the 1997 Royal Astronomical Society Gold Medal for Geophysics, and the 2010 Hannes Alfvén Medal from the European Geophysical Union in addition to awards for teaching and advising at Cornell. He was the recipient of the [CEDAR Distinguished Lecture in 2012](#).

Don was first and foremost a teacher and adviser whose door was never closed to his students. Many of Don's students, and some of their students, are working in radio and space physics today because of him. Don Farley was a brilliant, accomplished, and unpretentious scientist, teacher, and mentor. He will be sorely missed.

David Hysell Cornell University, Ithaca, NY, USA.

## Michael Charles Kelley (1943 - 2018)

Mike Kelley, pioneer of electric field measurements in space, renowned expert on the physics

of the ionosphere, inspiring teacher and mentor, died peacefully in Ithaca, NY on June 23, 2018. He was 74.

A highly accomplished scientist in the field of ionospheric physics, Mike literally “wrote the book” on the ionosphere, having authored: *The Earth's Ionosphere: Plasma Physics and Electrodynamics*, a seminal text now in its second edition with Academic Press.



Mike was born on December 21, 1943 in Toledo, Ohio, and grew up in Toledo and Detroit, Michigan. He attended Kent State University from 1961 to 1964 on an athletic scholarship, playing varsity basketball and majoring in mathematics.

At Kent State, he

won the Bordon and Manchester awards as outstanding Freshman and Senior man, respectively. Mike spent two summers at the Woods Hole Oceanographic Institute and then carried out graduate studies at the Physics Department of the University of California at Berkeley, earning his Ph.D. in 1970. Mike joined the UC Berkeley Physics Department as Forrest Mozer's first graduate student, helping to pioneer the development of electric field double probes and launching sounding rocket experiments to study both DC electric fields and plasma waves. In subsequent years, he was a post-doctoral researcher at Berkeley and held an appointment as a Von Humboldt Fellow with Gerhard Haerendel at the Max-Planck-Institute in Garching, Germany. In January 1975, he joined Cornell University as an Assistant Professor, advancing to full Professor in 1982.

A fervent experimentalist, Mike frequently combined measurements gathered with instruments carried into space on NASA sounding rockets with observations from NSF ground-based incoherent scatter and coherent scatter radars, consistently using the integrated scientific data to address unanswered questions regarding important physical processes. To this end, Mike led numerous NASA/NSF campaigns to international

sites such as Peru, Puerto Rico, the Marshall Islands, and Greenland and was known for organizing multi-faceted research activities within the wider scientific community. Highlights of Mike's many achievements (many carried out with electric field experiments on sounding rockets) include: in-depth studies of plasma turbulence in the equatorial ionosphere and the auroral zone, innovative techniques to determine plasma wave  $k$  vectors using multiple sensors on spacecraft, measurements of electrojet instabilities and their non-linear evolution, break-through observations of DC-coupled electric fields in space associated with tropospheric lightning with which Mike discovered that significant pulsed electric field energy penetrates into the ionosphere above lightning storms, direct measurements of Poynting flux with combined electric and magnetic field waveforms, studies of Alfvén's critical velocity effect, measurements from a rocket flown through the Arecibo heater beam to reveal parametric instabilities, an explanation of the long-standing enigma of polar summer mesospheric echoes at short wavelengths, simultaneous observations of sodium layers with rocket probes and a lidar, and an explanation of turbulent upwelling at mid-latitudes involving the Perkins instability.

During his distinguished career, Mike published more than 400 articles in the refereed literature. In addition to his text on ionospheric physics mentioned above, he wrote several other monographs including one entitled, “*The Earth's Electric Field: Sources from Sun to Mud*,” published by Elsevier in 2013 (written with R. Holzworth) as well as many reviews and articles for the general public including “*Plasma: The Fourth State of Matter*,” for the *Encyclopaedia Britannica*.

Mike received many distinguished awards, including the James B. Macelwane award from the American Geophysical Union of which he was a Fellow. He gave the AGU Nicolet lecture in 2011, and received numerous teaching awards from Cornell and the IEEE. In 1998, Mike became a Weiss Presidential Fellow, the most prestigious award for teaching at Cornell University, and in 2001, was elected the James A. Friend Family Distinguished Professor of Engineering. Mike was an associate of the National Academy of Sciences and was chair of the National Academy of Sciences Committee on Solar Terrestrial Research

and co-chair of the National Research Council Heliophysics Decadal Survey Subcommittee on Atmosphere-Ionosphere-Magnetosphere Coupling.

Mike is survived by his wife, Patricia, of 52 years, his three children Scott (Varykina), Brian (Elizabeth), and Erica, three grandchildren (Aidan, Owen and Amelia), and his brother Edward Arthur Kelley, Jr. Mike and Pat were very active in the regional foster child program and were parents to almost a dozen foster children. Mike was a life-long athlete – besides being an avid runner, he played basketball, volleyball, tennis, and golf, well into his later years. He also loved to journey about the planet and indeed felt that science was an adventure.

Beyond his many scientific achievements, Mike's legacy includes legions of graduate students whom he mentored (including 28 PhD students), many of whom stayed in the field and are now professors themselves. He was extremely open-minded and had an infectious enthusiasm for science and experimental research that stayed with him his entire life. An unparalleled leader in ionospheric research, Mike Kelley was a great scientist and human being – a true inspiration to us all.

Robert Pfaff, GSFC, NASA, USA

## Ram Gopal Rastogi (1929 – 2018)

Prof. Ram Gopal Rastogi was born in Allahabad on 26 December 1929. He obtained M. Sc. degree in Physics from Allahabad University in 1949 and started his academic career as a lecturer at Saugar University. He joined the Physical Research Laboratory (PRL) in Ahmedabad in 1951 as a research scholar in ionospheric physics under the guidance of Professor K R Ramanathan. His doctoral work was based on different features of ionosphere over Ahmedabad from radio soundings and also detailed investigations of ionosphere during the solar eclipse events



of 1954 and 1955. After completing his Ph. D., he worked as a post-doctoral fellow at National Research Council in Ottawa, Canada from October 1958 to December 1960. Later he worked as post doc at the High Altitude Observatory and guest worker at the Central Radio Propagation Laboratory at Boulder, USA from December 1960 to December 1961. Some of his important contributions in early years were the diurnal development of equatorial ionization anomaly and the longitudinal inequality of equatorial electrojet.

After his return to India, Prof. Rastogi as head of the ionospheric physics group at PRL, initiated several new activities. His most important contribution was the setting up of an ionospheric observatory near magnetic equator at Thumba, the location of India's first rocket range, with spaced receiver drift experiment, an ionosonde, two riometers and a radio beacon receiver. Combined ground magnetometer and ionosonde observations in multi-technique investigations revealed several new features of equatorial ionosphere. Reversal of electric fields leading to counter electrojet and disappearance of equatorial sporadic-E both during geomagnetic quiet and disturbed conditions was established from such measurements from Thumba. Role of interplanetary magnetic field in affecting the equatorial ionosphere was also demonstrated for the first time from measurements from Thumba.

Another important contribution of Prof. Rastogi was the setting up of a sophisticated beacon receiver at Ootacamund, near magnetic equator, with collaboration of Prof. Ken Davies of NOAA, Boulder, during the ATS-6 phase II for a year in 1975-76. Multi-frequency measurements of Faraday rotation, differential phase, group delay and amplitude scintillations constituted one of the best radio beacon data collected anywhere. In addition a chain of radio polarimeters was set up to measure Faraday rotation at 6 stations extending from magnetic equator to beyond the equatorial anomaly crest region, in collaboration with different institutions/universities in India.

Prof. Rastogi moved to the Indian Institute of Geomagnetism (IIG) in Mumbai in 1980 as Director. At IIG, he expanded the chain of magnetic observatories including the magnetic observatory at Maitri in Antarctica, initiated modernization of instruments, and introduced new instruments

for micro-pulsation and magneto-telluric studies. He set up the Equatorial Geophysical Research Laboratory (EGRL) at Tirunelveli. Collaborations were started with research groups from different countries to start new experiments like MF partial reflection radar for studying mesospheric winds, all sky imaging camera to map night air-glow emissions for study of large-scale plasma depletions associated with equatorial spread-F, photometers for spaced receiver measurements of air-glow emissions, and a chain of VHF receivers for ionospheric scintillation studies.

As chairman of the Steering Committee of the All India Coordinated Program on Ionospheric-Thermospheric Studies (AICPITS) of the Department of Science and Technology, Government of India, he organized a collaborative inter-university program on ionospheric studies as part of the International WITS program. As part of this program a chain of 20 stations right from magnetic equator to beyond the anomaly crest region provided unique data set for VHF scintillation studies at low latitudes, involving and inspiring many University groups to take up ionospheric studies. Prof Rastogi continued his research activity after retirement from IIG in 1989 and worked at PRL/Gujarat University as CSIR Emeritus Professor/INSA Emeritus Professor. He was actively working as an Honorary Professor at PRL till last year. He has guided 24 Ph. D. students and published 435 papers in reputed international journals.

Professor Rastogi was Fellow of all the three scientific academies of India. He has been honoured with Hari Om Ashram Prerit Research Award in Physics by Gujarat University for years 1971-76, NASA award for excellent performance of ATS-6 Radio Beacon Program 1977, NASA Award for excellent performance in MAGSAT Program 1982, USSR Academy of Science Commemoration medal for developing the Indo- USSR joint research program in Geomagnetism, Japanese Geophysical Society Commemoration medal for contribution to Geomagnetism and Ionospheric Research in 1984, and Prof. K. R. Ramanathan Medal in recognition of his contributions in Atmospheric Sciences and Meteorology in 2002. During his tenure as chairman of the Interdivisional Commission on Developing Countries of IAGA, Prof. Rastogi helped coordinate research pro-

grams in developing countries. He organized international schools on Ionosphere and Geomagnetism at Pune, India in 1985 and ICTP at Trieste, Italy in 1987.

Professor Rastogi passed away, after a period of brief illness, on 10 July 2018 at Ahmedabad. He is survived by his four sons and a daughter, and their families. His contributions to ionospheric and geomagnetic research will be remembered for years to come, by the International Scientific Community.

Harish Chandra  
Physical Research Institute, Ahmedabad, India (Former student of  
Prof. Rastogi)

### Ahmed Hady (1952 – 2018)



Prof. Ahmed was born on January 10, 1952, in Egypt. He got his Ph. D. in April 1984 from Institute of Physics, Technical University of Wrocław, Poland. After obtaining the Ph.D. degree, he joined as lecturer in Cairo University in

Egypt, where he continued to work and attained the position of Professor of Solar Physics and space science in the Department of Astronomy, Faculty of Science, Cairo University. As an Arabic speaker, Prof. Ahmed worked in Salahaddin University in Iraq during 1988-1990 and as Public Authority for Applied Education in Kuwait during 1992-2000. In 2015, he was elected as Vice-Chair of IAGA Interdivisional Commission on Developing Countries.

Prof. Ahmed was an active IAGA member, and organized a series of International Symposia in Egypt, supported by IAGA. The first Symposium of the series, held in Cairo, Egypt, in October 2008, was entitled "Space Weather and its effects on Space-crafts". The second one was also held in Cairo, Egypt, in December 2009, and it was entitled "Solar Wind-Space Environment Interaction". The third one, held in Luxor, Egypt, in November 2011, was entitled "Heliospheric Physics during

and after a deep solar minimum". The IAGA-IV symposium entitled "Influence of short and long term solar variability on climate" was held in Hurghada, Egypt, during 20-24 March 2016.

Prof. Hady has published more than 100 scientific publications, including many peer reviewed journal articles and books. He published more than 20 books (in Arabic) for Simplification of Science, and was awarded the Egyptian State Prize in popular science publications in 2004 and 2012.

On July 14, 2018, Prof. Hady passed away after short illness.

Ayman M. Mahrous  
Space Weather Monitoring Center (SWMC) Helwan University,  
Egypt

## Paul Georgescu (1939-2018)

Professor emeritus Dr. Paul Georgescu was a member of several professional associations in the country and abroad: President of the Romanian Society of Geophysics, Vice President of the Balkan Geophysics Society, Corresponding Member of the Academy of Technical Sciences and member of the European Association of Geoscientists & Engineers (EAGE). Graduate of the Faculty of



Technical Geology of the University of Bucharest (1957-1962), he obtained his PhD degree in 1977 and from 1993 onward he was Empowerment to direct research.

He also had a long experience in higher education for more than 50 years, where for 13 years (1992 - 2005) he was the head of the Department of Geophysics at the Faculty of Geology and Geophysics. Among the fields of expertise in which Prof. Dr. Georgescu excelled as a true school creator and a world-class scientific researcher, was Applied Geophysics, Environmental Geophysics, 1D, 2D and 3D Modeling of Electric Resistivity Anomalies. He participated in numerous national and international research projects with a very diverse themes, related to theoretical bases and practical applications of geophysical investigation methods of the basement. He received the "Gheorghe Munteanu Murgoci" Romanian Academy Award (1977), the "Sabba Ștefănescu" Romanian Geophysics Society Award (1995) and the Certificate of Outstanding Achievements in Romanian Geophysics awarded by the Society of Exploration Geophysicists (SEG).

The Department of Geophysics of the Faculty of Geology and Geophysics of the University of Bucharest and his former students will have an eternal gratitude and admiration for Emeritus Professor Eng. Paul Georgescu, for his support and contributions to the Romanian School of Geophysics.

Anca Isac  
Geological Institute of Romania, Bucharest, Romania

## 9 General information about IAGA

### 9.1 IAGA books series

A series of five books, representing the five IAGA Divisions, provides a comprehensive overview over all fields of IAGA science, including the state of the art at the time of writing (~2010). The books are written and edited by experts in their fields. Published by Springer, the income from the books supported scientists to attend the IAGA Scientific Assembly in Sopron.



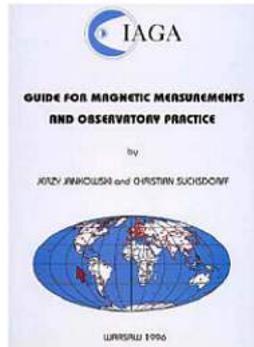
## 9.2 IAGA Guides

IAGA has published four practical guides to observation. These are available as pdf documents from the [IAGA web site](#), or they may be ordered from the IAGA Secretary General.

### IAGA Guide for Magnetic Measurements and Observatory Practice

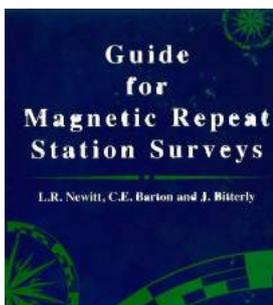
by J. Jankowski and C. Sucksdorff, 1996, 232 pages, ISBN: 0-9650686-2-5; Price: USD 50.

This Guide provides comprehensive information about how to organize and run a magnetic observatory and make magnetic measurements. The main topics are:



- A brief description of the magnetic field of the Earth
- Selection of observatory sites and layout
- Magnetometers
- Absolute magnetic measurements
- Recording of magnetic variations
- Data processing
- Testing and calibrating instruments

### IAGA Guide for Magnetic Repeat Station Survey

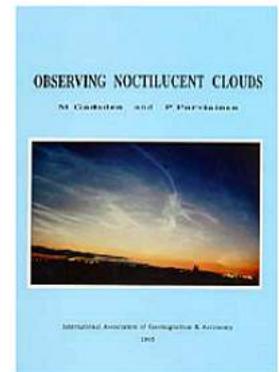


by L.R. Newitt, C.E. Barton, and J. Bitterly, 1997, 120 pages, ISBN: 0-9650686-1-7; Price: USD 25.

This Guide provides a comprehensive description of the theoretical basis, operational details, and instrumentation for making magnetic repeat station survey measurements.

### IAGA Guide to Observing Noctilucent Clouds

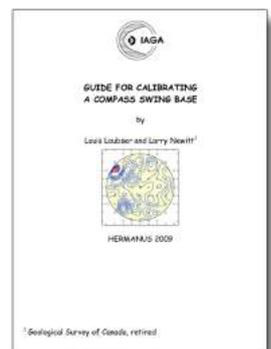
by M. Gadsden and P. Parviainen, 1995, ISBN: 0-9650686-0-9; Price: USD 25.



This manual and instruction book was written by a group of active researchers, both professional and amateur. There are chapters giving practical advice for taking visual observations, photographing the clouds with film or with video equipment. A summary of observations from space is included, as well as comments on the connection between noctilucent clouds, seen from the ground, and the polar mesospheric clouds that so far have been measured only from orbit. Noctilucent clouds are seen in the summer months, shining in the poleward sky at nighttime. Measurements show that the clouds are higher than any others. Lying at a height of 80-85 kilometres, the clouds mark a boundary between meteorology and space physics. This book is beautifully illustrated with photographs, and will help everyone recognize and appreciate these "sailors in the summer night".

### IAGA Guide for Calibrating a Compass Swing Base

by L. Loubser and L.R. Newitt, 2009, 35 pages, available only as Electronic version (PDF).



In this guide a general description of a compass swing base calibration procedure is presented which was developed at the Hermanus Magnetic Observatory. The procedure is based on the use of DI flux magnetometers as these types of magnetometers are widely in use. Although there are also other methods in use the 'DI-method' should be seen as an IAGA recommendation.

## 9.3 IAGA website

Information on IAGA can be found at: <http://www.iaga-aiga.org>

## 9.4 IAGA contact

The Secretary-General is the main point of contact for all matters concerning IAGA:

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