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\* I S W I = International Space Weather Initiative \*  
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Attachment(s):

- (1) "COSPAR Meeting Reports", 613 KB pdf, 8 pages.

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: Re:  
: Meeting Reports  
: (published in COSPAR  
: information bulletin)

Dear ISWI Participant:

The attached pdf consists of eight pages (various meeting reports).  
They come from "COSPAR's Information Bulletin: Space Research Today",  
Number 180, March 2011. (Courtesy of Dr Hans Haubold of UNOOSA.)

There are two meeting reports directly related to ISWI:

- (1) First International Space Weather Initiative (ISWI) Summer School, Bahir Dar, Ethiopia, 28 Oct - 4 Nov of 2010.
- (2) First UN/NASA/JAXA Workshop on the ISWI, Helwan University, Cairo, Egypt, 6-10 Nov 2010.

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Please note that the second ISWI workshop is scheduled to take place in Nigeria this year October and third one is scheduled to take place in Ecuador next year.

Faithfully yours,  
: George Maeda  
: The Editor  
: ISWI Newsletter

These 8 pages come from:  
COSPAR's Information  
Bulletin:

Space Research Today,  
Number 180,  
March 2011.

Courtesy of  
Dr Hans Haubold of the  
United Nations Office for  
Outer Space Affairs, Vienna.

## Meeting Reports

### 5<sup>th</sup> International Committee on Global Navigation (ICG) Meeting, Turin, Italy, 18-22 October 2010

[Report by J.B. Zielinski, SRC PAS, Warsaw]

The International Committee on GNSS is a rather young international organization, created in 2005 under the umbrella of the UN Committee on the Peaceful Uses of Outer Space (COPUOS). From the very beginning, COSPAR has been among the founding organizations and now has observer status on this Committee. At the COSPAR Scientific Assembly in 2008 in Montreal, the ICG was invited to hold an 'Expert Meeting on Global Navigation Satellite Systems and Services'. Since then, there have been a number of initiatives of interest to both ICG and COSPAR.

This year, the 5<sup>th</sup> ICG Meeting was held in Turin, Italy, from 18 to 22 October 2010. The conference agenda was in three parts: Plenary session, Working Group meetings and Providers' Forum. More than 200 experts attended the meeting from countries and organizations belonging to ICG.

At the Plenary meeting, overview reports were presented; these concerned the status and development of the various existing and planned systems, e.g., American GPS, Russian GLONASS, European Galileo, Chinese COMPASS, Japanese QZSS and Indian INRSS,

all of them with the proper augmentations. In all presentations, the positive achievements were reported, though the audience paid special attention to the Chinese results. China is making fast progress, with three satellites already in orbit, while the entire system will consist of five GEO and 30 MEO spacecraft. The Chinese system will be global, open and compatible with other global and regional systems and is to be completed by 2020.

During the Plenary session, organizations supporting the ICG gave accounts of their activities: these covered presentations from the International GNSS Services, the Civil GPS Service Interface Committee, the International Telecommunication Union, the International Federation of Surveyors and COSPAR. The COSPAR presentation primarily concerned the activity of the PSD Panel and the Colloquium on Scientific and Fundamental Aspects of the Galileo Programme, 14-16 October 2009, organized at the University of Padova with COSPAR sponsorship. The meeting in Padova was probably the only strictly scientific event devoted to GNSS during 2009. The message of this presentation was that GNSS is not only a very practical common utility, but also a powerful modern tool for advanced scientific research.

The compatibility and inter-operability of the various systems was the most important subject of the whole conference. Working Group A was responsible for the preparation of specific recommendations. The problem is that when all the Global Navigation Satellite Systems are completed, they will have more than 120 satellites in space. The GNSS could be of tremendous advantage to users, providing that they will all be compatible in terms of geodetic and timing systems, frequency sharing as well as avoidance of interference. It has also been recognized that the political aspects of GNSS have to be addressed. With one particular exception, Europe's Galileo, all the systems have so-called double use devotion, which means that they are designed for both civil and military use. Therefore, the owners/operators consider some technical parameters as sensitive or classified. ICG is the best platform where these delicate problems can be discussed and sorted out.

The discussion within Working Group D (many of whose members belong to the COSPAR community) of the geodetic reference frame and the homogenous universal time scale was very substantial. The problem of the reference frame is closely related to problems of the Earth's dynamics and gravity field, these being within the remit of the COSPAR Sub-Commission B-2 on Space Techniques for Geodesy and Geodynamics. Here, the good relations between the US and the EU are reflected in the High Level Agreement between these two parties signed in June 2004. In this Agreement, the principle of inter-operability was declared, though, in practical terms, the realization of the reference frame and time scale is based on different stations and time laboratories. Therefore, even in this case, further discussions about modelling and procedures are necessary. The problem becomes far more complicated when four or more systems have to be considered.

Some very interesting problems appeared with respect to time counting. The International Bureau of Measures and Weights (BIPM) disseminates the coordinated Time Scale UTC with the so-called leap seconds. This is a kind of compromise between the physical definition of the second of time and astronomical counting of time, but the net result is that the UTC is not homogeneous, but discontinuous with 1 s steps from time to time. The same scale is accepted by GLONASS, while GPS keeps autonomous time scale as defined by the US Naval Observatory. So, two of the most advanced GNSS systems have different time scales. It provokes the discrepancy that must be accounted for in all practical applications. Now, BIPM is trying to eradicate the leap second and create the homogenous UTC.

ICG noted that remarkable progress had been made during the relatively short period of its existence – in the technical level of meetings, as well as in international political recognition. It seems that all countries working on GNSS now accept the need for mutual agreement and cooperation. The problem for owners and service providers of the military use of all the systems except Galileo seems to be diminishing. However, the issues of management, operation and financing are still solved individually by each system operator. This is also reflected in ICG, where the spacecraft Providers' Forum holds

separate meetings and prepares an independent communiqué.

COSPAR's involvement in the work of ICG is a natural obligation resulting from Article I of its Charter that requires it to provide scientific advice to UN bodies. However, it is also significant because it demonstrates very clearly the link between so called pure science and very practical applications. On the other hand, the further development of GNSS will open new possibilities for a very wide spectrum of research.

### **First International Space Weather Initiative (ISWI) Summer School, Bahir Dar, Ethiopia, 28 October – 4 November 2010**

The IHY programme has successfully deployed a significant number of ground-based instruments in Africa designed to understand the physics behind the unique ionospheric irregularities in the equatorial African region, and has been attracting a lot of attention. One of many objectives of the IHY programme was to lay down new space weather research infrastructure within developing countries, such as those in Africa. However, even if the ground-based instruments are available in their back yards, many young African professors do not fully comprehend what kind of scientific investigations they can undertake with the data they are collecting. Therefore, to provide basic space science understanding, data analysis and data assimilation techniques to local, especially, young professors, postdocs and postgraduate students, the ISWI 2010 summer school was organized in Bahir Dar, Ethiopia from 28 October to 4 November 2010. The summer school is a continuation of the very successful IHY-Africa 2009 summer school, which was held in Akure, Nigeria in February 2009.

The International Space Weather Initiative (ISWI) is a continuation of the recently ended successful programme called the International Heliophysical Years (IHY). The additional aims of the summer school were to bring together African and other international scientists under one roof, facilitate the deployment of new observational infrastructure to study space weather, spark interest in space

science education and research, and encourage the next generation of African scientists to become interested in the space sciences. As has been shown from previous similar summer schools, we believe these young scientists and graduate students will contribute significantly to the operation of future instruments (mostly provided by scientists from the US) and undertake interesting scientific investigations with data from the instruments that are installed in the African continent.

The summer school was arranged through an organizing committee with both local and international members. It attracted a total of 56 participants, of which 42 represented 16 different African countries with 14 instructors coming from six different countries (8 from USA, 2 from Ethiopia, and one each from Canada, Germany, Japan and Nigeria).

Due to the generous sponsorship that the summer school received, 22 African delegates outside Ethiopia and three instructors were sponsored in full. Among these, the airfare of 21 African participants and one instructor (from Nigeria) were sponsored by NASA. The airfare of one African participant from beyond Ethiopia was met by Kyushu University. The accommodation and local expenses of all African participants outside Ethiopia were sponsored by CAWSES and EORD. Similarly, the remaining instructors were sponsored by a variety of different agencies including Boston College, AFRL Cambridge, the University of Michigan, NASA, the ICTP, the University of Calgary, Kyushu University, the German Aerospace Center (DLR), and (partially) by MIT. All the participants from Ethiopia and all other local logistics were sponsored by EOARD, ICTP, COSPAR and Bahir Dar University.

The workshop was held in the Ethio Star Hotel in Bahir Dar. All the participants, except the instructors who made their own accommodation arrangements elsewhere, were accommodated in the Ethio Star Hotel. The local organizing committee (LOC) coordinated all the accommodation arrangements with the Ethio Star Hotel, whose staff also arranged the meeting hall and all the meals and tea breaks.

The opening ceremony, on 28 October 2010 which included presentations in the conference hall followed by an ice breaker dinner

at Tana Hotel, was chaired by Dr Baylie Damtie, (Academic Vice-President of Bahir Dar University and Chair of the Organizing Committee). This ceremony was attended by, among others, the President (Dr Yeshimebrat Mersha) and Vice-Presidents of Bahir Dar University. Presentations were made by Dr Natchimuthuk Gopalswamy (of the International Space Weather Initiative Secretariat) as well as a few representatives of the sponsors. The two Ethiopian guests of honour also made presentations designed to motivate the scientific fraternity in Ethiopia. In particular, the deputy president of the Amhara region, who represented the Ethiopian government, gave an account of the Ethiopian government's commitment to science and technology and vowed to continue supporting the space science development in the country. He also indicated his appreciation for the presence of the ISWI 2010 summer school in Bahir Dar.

The scientific programme of the summer school included the following main heliophysics sessions:

- Introduction to space science
- Scientific instruments for space exploration
- Modern data analysis, interpretation methods, and programming in open source
- Space Weather (Sun-to-Earth Coupling)
- Ground- and Space-based GPS TEC
- Equatorial electrodynamics
- Data Resource Pointer

These science sessions included more than 40 lectures with the main focus being on the kind of science that can be done with the data recorded by the instruments deployed in the African region and how the data can be utilized. In addition, there was one laboratory demonstration session, convened by Dr Baylie Damtie in his well-equipped computer laboratory, using openly available software. This experience was much appreciated by all the participants who expressed their universal wish to have such software demonstrations at similar future summer schools and even at workshops. There were also sessions in which participants were able to access live demonstrations at the sites where VHF receivers had been deployed by AFRL Cambridge. Similarly, the DLR deployed a GNSS receiver in parallel to the summer school.

Included in the programme was an open discussion forum, convened by Professor Mark Moldwin and Dr Babatunde Rabi, focused on instruments and databases, and on possible barriers to the expansion of space science education and research in the African continent. During this discussion, participants underlined that additional training courses in space weather data analysis and interpretation was high priority for young African scientists. As Africa begins to employ and benefit from space weather applications, it was recognized that it was important to initiate programmes in space science education and research at the university level for capacity building and sustainability. However, the main barriers in the region towards this effort were the lack of resources such as textbooks, and suitable software for data analysis. The participants unanimously supported the request that the AGU allow African scientists free access to its articles. Professor Moldwin donated copies of his book *Introduction to Space Weather* to some of the participants.

Students and professors from Africa, who attended, acknowledged that they had gained much from the summer school and urged the responsible body to continue such summer schools in different parts of Africa. Such summer schools not only supports ISWI goals, but also accelerate the basic science understanding among African scientists thereby helping to provide education in space weather studies in those African countries that have never had space weather programmes in any of their universities. Also along these lines, Boston College (BC) and the International Centre for Theoretical Physics (ICTP) had already set up partnerships and organized a series of workshops for university professors, young scientists and graduate students from Africa on GNSS hardware, applications and scientific studies with GNSS.

One of the main organizers of this series of workshops, Professor Patricia Doherty (also an instructor at the Bahir Dar summer school) announced that the third workshop in the series was scheduled to be held in Abuja, Nigeria in October 2011.

Participants in the Summer School came from Algeria, Cameroon, D. R. Congo, Ethiopia, Ivory Coast, Kenya, Madagascar, Malawi,

Nigeria, Rwanda, South Africa, Sudan, Tanzania, Uganda and Zambia.

**Concluding Remarks:** Nat Gobalswamy (Secretary of the ISWI international secretariat), confirmed that the summer schools will be continued under the umbrella of the ISWI. At the end of the summer school, questionnaires (on reactions to the summer school) were distributed to all participants, and the response received was enormous. The overall rating (that covered the quality of the lectures, organization, accommodation, food, accessibility, etc) of the Bahir Dar summer school by the participants was 9.2 out of 10. Almost 100% of the participants recommended the continuation of such summer schools once in a year. Finally, each participant received a '*Certificate of Appreciation*'.

In parallel with the summer school, Professor Moldwin and Dr Endawoke Yizengaw spent one evening with Bahir Dar University physics department students during which the importance of space weather and its impact on our daily lives was outlined. In addition, the Bahir Dar city education office brought more than 500 students from two high schools in Bahir Dar to the city hall where Professor Moldwin and Dr Yizengaw made short presentations on science in general and space weather in particular, showing the importance of science in our daily lives. The students were introduced to the scientists who entertained a question and answer session which lasted for more than two hours, some of which clearly demonstrated how the younger generation can be inspired by and develop an interest in science.

The summer school was used as a vehicle to provide a forum in which African space scientists were able to meet and make contact with like-minded colleagues and with international specialists in the field. Social activities were also included in the programme which helped participants interact with and get to know each other. Summer schools like these form a very valuable tool for fostering scientific research in Africa and should be encouraged and supported.

This summer school would have not been possible without the support of the sponsors, and our special thanks go to them all.

Nor would the school have been successful without the support and hard work of the Ethiopian organizing team.

The meeting was hosted by Bahir Dar University, Ethiopia, in collaboration with Boston College, USA, with an Organizing Committee having the following members: Baylie Damtie, Tsegaye Kassa, Abiyot Bires, Endawoke Yizengaw, Melessew Nigusie, Mogese Wassai and Zinaye Teffera.

The sponsors included NASA, the European Office of Aerospace Research and Development (EOARD), SCOSTEP's Climate and Weather of the Sun-Earth System (CAWSES), COSPAR, ICTP (Italy), Bahir Dar Univ. (Ethiopia), Boston College (USA), AFRL Cambridge (USA), Univ. of Michigan (USA), Kyushu Univ. (Japan), Univ. of Calgary (Canada), Massachusetts Institute of Technology (USA), DLR (Germany).

### **FUNCEME-COSPAR Training and Capacity Building Course on Earth Observation Understanding of the Water Cycle Over Land and Ocean, Fortaleza, Brazil, 1-12 November 2010**

[Report by A. G. Ferreira]

The FUNCEME-COSPAR Training and Capacity Building Course on Earth Observation Understanding of the Water Cycle over Land and Ocean took place in Fortaleza, Brazil from 1 to 12 November 2010 ([www.funceme.br/eos.cospar](http://www.funceme.br/eos.cospar)). The host institution, FUNCEME (Fundação Cearense de Meteorologia e Recursos Hídricos), is a non-profit regional institute, linked to the State Government of Ceará (located in the city of Fortaleza), that develops activities in the areas of meteorology, environmental resources and water resources ([www.funceme.br](http://www.funceme.br)). The lectures, both theoretical and practical, were developed at the Instituto Aldys Mentor from Fortaleza ([www.aldymentor.org.br/src/frmPrincipal.aspx](http://www.aldymentor.org.br/src/frmPrincipal.aspx)). This Institute is also a non-profit institution, and is dedicated to the promotion of human and social development and to the integration of less educated citizens into the digital world. The Institute has a first-class infrastructure in lecture rooms and computing and audiovisual equipment which were

lent to the Course in an altruistic way. Students and lecturers were accommodated at the Hotel Beira Mar in Fortaleza.

The main aim of the two-week COSPAR Panel on Capacity Building Course was to train postgraduate students and young researchers from different countries, but especially from Latin America, to improve their understanding of the water cycle, particularly with respect to observations from space. The activities of this educational project were framed within the ambit of COSPAR Scientific Commission A on Space Studies of the Earth's Surface, Meteorology and Climate, and – more specifically – within Sub-Commission A2 on Ocean Dynamics and Productivity and Sub-Commission A3 on Land Processes and Morphology.

The postgraduate students and young researchers arrived from a variety of different Earth science disciplines, but all wishing to expand and improve their knowledge of and skills with remote sensing techniques as applied to water cycle studies. A total of 70 applications for the Course were received, 30 of whom were selected after a detailed analysis and study of the applications. Many of these, from less developed countries, fulfilled the main requirements for capacity building, that is, appeared able to transfer the knowledge they would acquire during the Course to their respective institutions. The home institutions of the selected students were in Argentina (7), Brazil (12), Chile (1), China (2), Colombia (1), Egypt (1), India (1), Mexico (2), Russia (1), Sudan/Germany (1), Uganda/Austria (1).

The main goals of the Course were to improve understanding of the hydrological cycle, using data obtained by satellites. In addition, the Course was designed to:

- i) increase the participant's knowledge as to how to access and use public archives of the data generated by sensors on the satellites operated by the various space agencies such as ESA, INPE, NASA and NOAA;
- ii) instruct the participants, through theoretical and practical lectures, on the use of specialized toolboxes to extract data from satellite images and generate products with a particular reference to soil moisture and ocean salinity; and



Students and lecturers pose during Capacity Building Course on the Water Cycle, at Fortaleza, November 2010.

relationships between students and the experienced lecturers who led the Course.

In addition to a general introduction on water cycle studies both over the land and over the ocean, the Course included lectures covering statistical data analysis as well as an introduction/revision of remote sensing concepts, its principles, methodologies and applications, with the following highlighted topics: Introducing Satellite Remote Sensing, Digital Image Processing Techniques, Remote Sensing Applications for Land, Ocean and Atmosphere, Validation of Remote Sensing Data and Products, and Assimilation of Remote Sensing Data and Products in Numerical Prediction Models.

Special attention was paid to the need to acquaint the students with details of the ESA's *SMOS* (*Soil Moisture and Ocean Salinity*) water mission, by means of a thorough explanation of the different *SMOS* data and products, as well providing training on the different ESA toolboxes. The Course also took account of the SeaWiFS/MODIS sensors on *Seastar* as well as the planned NASA Aquarius and NOAA GPM missions. The students had the opportunity to present the results of their course work during a special session.

The lecturers for the Course were all researchers with specialist knowledge and experience of in the various Course topics. The home institution of the lecturers were: the Agência Espacial Brasileira (AEB), Brazil, Centre

d'Études Spatiales de la BIOSphère (CESBIO), France; Comisión Nacional de Actividades Espaciales (CONAE), Argentina; European Centre for Medium-Range Weather Forecasts (ECMWF), UK, ESA-ESRIN, Italy; Fundação Cearense de Meteorologia e Recursos Hídricos (FUNCEME), Brazil; Institut de Ciències del Mar (ICM), Spain; Instituto Nacional de Pesquisas Espaciais (INPE), Brazil; Instituto Oceanográfico da Universidade de São Paulo (IOUSP), Brazil; Instituto de Tecnologia da Informação e Comunicação (ITIC), Brazil; Institut de Recherche pour le Développement (IRD), France; NOAA, USA; Royal Meteorological Institute of Belgium (KNMI), Belgium; Universidade Federal da Bahia (UFBA), Brazil; Universidade Federal de Campina Grande (UFCG) Brazil; Universitat de València – Estudi General (UVEG), Spain.

The organizers would like to emphasize that the Course was scheduled in a serendipitous way with respect to the launch and operational start of ESA's *SMOS* mission. As a consequence, special attention was given to training the Course participants on the use of the ESA toolboxes related to the mission and to the use and exploitation of the different *SMOS* land and ocean data and products. Moreover, we would like to highlight the contributions of ESA, CESBIO, ICM, ECMWF and the University of Valencia that showed their recent activities in relation to

their respective mission assignments, namely the retrieval and validation of land and ocean products and their assimilation into the ECMWF Community Microwave Emission Model (CMEM).

We would like to thank COSPAR for the support, guidance and assistance provided in all the phases of the course, as well as ESA for the continuous collaboration in the course's organization. Especially, we would like to thank Dr Volker Liebig (Director of ESA's Earth Observation Programmes, ESA/ESRIN, Frascati, Italy) for the significant financial support provided which upgraded and raised the standard of the course. The heart and soul of the course has undoubtedly to be A. Geraldo Ferreira who, with FUNCEME, dedicated all his efforts and time to making the course a 100% success. We also acknowledge the support provided by the AEB (Brazilian Space Agency), INPE (Brazilian National Institute for Space Research) and the Aldy Mentor Institute.

All the participants, both lecturers and students, recognized that the Course had been successful. The dedicated lecturers experienced splendid collaboration and interaction with the students, at all times, which easily helped us achieve the course goals. From the very beginning to the last instant, all the students showed an extraordinarily good spirit of companionship that still continues while trying to define and establish some sort of professional networks for developing further collaboration based on the friendships that emerged during the Course. The gratitude of the students was finely expressed in a document that can be freely downloaded from [ftp://ftp.funceme.br/FUNCEME\\_COSPAR/](ftp://ftp.funceme.br/FUNCEME_COSPAR/) and which was shown by the students at the closing ceremony.

### **First UN/NASA/JAXA Workshop on the International Space Weather Initiative, Helwan University, Cairo, Egypt, 6-10 November 2010**

[By S. Gadimova & H.J. Haubold, UN Office for Outer Space Affairs, Vienna]

**T**he United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS), in its fifty-second session in Vienna from 3 to 12 June 2009, noted

the importance of continuing to build upon the successes of the International Heliophysical Year 2007 (IHY 2007, <http://ihy2007.org/>), in particular by deepening the understanding of the function of the Sun and its effects on the Earth's magnetosphere, environment and climate. It noted with satisfaction the agreement reached by the Scientific and Technical Subcommittee at its forty-sixth session to consider, beginning at its forty-seventh session in February 2010, a new agenda item entitled 'International Space Weather Initiative (ISWI)' under a three-year work plan (2010, 2011, 2012) with a specific focus on the effects of space weather on the Earth. ISWI will utilize the ground-based world-wide IHY instrument arrays under deployment since 2005.

At that time, international ISWI workshops had been scheduled to be hosted by Egypt (2010) for Western Asia, Nigeria (2011) for Africa, and Ecuador (2012) for Latin America and the Caribbean. The 2009 UN/ESA/NASA/JAXA Workshop on Basic Space Science and the International Heliophysical Year 2007, held in the Republic of Korea in 2009, started the implementation of the ISWI – as put forth by UNCOPUOS ([http://bssihy.kasi.re.kr/unbssw\\_newsletter.aspx](http://bssihy.kasi.re.kr/unbssw_newsletter.aspx)). Initial important elements of ISWI are the issuance and maintenance of an ISWI website, being effected by Bulgaria ([www.iswi-secretariat.org/](http://www.iswi-secretariat.org/)), and an ISWI Newsletter, provided by Japan, on a continuing basis in the period of time 2010-2012 to assure world-wide delivery and development of the results of the ISWI and its space weather instrument arrays. From the beginning, this effort will cover all 192 Member States of the United Nations.

The first workshop on the ISWI ([www.spaceweather-eg.org/iswi/](http://www.spaceweather-eg.org/iswi/)), held in Egypt in November 2010 was co-organized and co-sponsored by Kyushu University of Japan ([www.serc.kyushu-u.ac.jp](http://www.serc.kyushu-u.ac.jp)) and the International Committee on Global Navigation Satellite Systems (ICG, [www.unoosa.org/oosa/en/SAP/gnss/icg.html](http://www.unoosa.org/oosa/en/SAP/gnss/icg.html)). Local organization and sponsorship were provided by the Ministry of Higher Education of Egypt, Helwan University, and the Space Weather Monitoring Centre at Helwan University ([www.helwan.edu.eg/english/space/home.html](http://www.helwan.edu.eg/english/space/home.html)).

More than 120 scientists, engineers, and policy makers from 30 countries attended the workshop. Its programme was focused on the fact that the variability of the Sun has adverse impacts on planet Earth. As society becomes increasingly dependent on space-based systems, it is vital to understand how space weather, caused by solar variability, does affect, among other things, space systems and human space flight, electric power transmission, high-frequency radio communications, global navigation satellite system (GNSS) signals and long-range radar, as well as the well-being of passengers in high altitude aircraft. ISWI is fully utilizing and expanding as fast as feasible the world-wide, ground-based instrument arrays that have been deployed during the five years of the IHY campaign for monitoring the impact of solar variability on the Earth. The workshop comprised in-depth presentations of the results from space weather instrument arrays such as MAGDAS (Japan), CIDR (US), SCINDA (US), GPS-Africa (France), CALLISTO (Switzerland), SAVNET (Brazil), AMBER/AGREES (US), and AWESOME/SID (US) which already cover more than 80 countries around the globe. All these instrument arrays have been deployed in countries in Africa and around the equator. Close to 1000 space weather instruments are operational and are recording data by utilizing GPS receivers, magnetometers, very low frequency recorders, solar particle detectors, and spectrometers.

The main results emanating from the workshop concern future expansion of all instrument arrays, data recording techniques, data analysis and image processing methods, coordination of collaboration among members of with instrument arrays, as well as utilizing the data and images for research and applications.

## Publications

### Contributions to *Space Research Today* – A Reminder

Anyone may submit an article or news item to *SRT* and, in the spirit of a bulletin publication, we aim to be as flexible as possible in the submission procedures.

- Submission should be made in English, by e-mail to any member of the Editorial Team (see inside front cover for contact details)
- Submissions may be made in the following formats:
  - E-mail text (especially appropriate for short news or information items)
  - Word files with embedded images (in colour or greyscale)
  - Other formats can be considered; please contact the editorial team with your request
- Deadlines: 1 February for the April issue, 1 June for the August issue, and 1 October for the December issue.

The editors will always be pleased to receive the following types of inputs or submissions, among others:

- Research Highlight articles – generally substantial, current review articles that can be expected to be of interest to the general space community, extending to over five pages or so (*ca.* 1200-1500 words with figures and images – which may be in colour). These submissions should include a brief, one paragraph statement ‘About the Author’ and be accompanied by an image of the author.
- Research Notes – short research announcements, up to three or four pages, with images as appropriate.
- News and Views, and ‘In Brief’ items – short announcements and news items (generally amounting to one page or less).
- In Memoriam submissions – Articles extending to a few pages, including an image, about a significant figure in the COSPAR community.
- Letters to the Editor – up to two pages on any subject relevant to COSPAR and space research in general.
- Meeting announcements, meeting reports and book reviews.

Articles are not refereed, but the decision to publish is the responsibility of the General Editor and his editorial team.