UNITED NATIONS / ECUADOR

WORKSHOP ON THE INTERNATIONAL SPACE WEATHER INITIATIVE

2012

Final Report

Quito, Ecuador
8th to 12th October 2012

UNITED NATIONS / ECUADOR

Workshop on the International Space Weather Initiative

Organized jointly by:

The United Nations Office for Outer Space Affairs and the
Quito Astronomical Observatory of the National Polytechnic School of Ecuador
on behalf of the Government of Ecuador

Represented by

National Secretariat of Higher Education, Science, Technology and Innovation and
Ministry of Foreign Affairs, Trade and Integration

Co-organized jointly and co-sponsored by:

National Secretariat of Higher Education, Science, Thechnologu and Innovation (SENESCYT)
International Center for Space Weather Science and Education (ICSWSE, Japan)
National Aeronautics and Space Administration (NASA, US)
Japan Aeronautics and Space Administration (JAXA, Japan)
Latin America Center of Physics (CLAF)
Comimttee on Global Navigation Satellite System (ICG)
International Astronomical Union (IAU)
Commite on Space Research (COSPAR)

Topics

Heliosphere and cosmic rays
Ionosphere, thermosphere and mesosphere
Climate studies
Data analysis and image processing methods
Atmospheric physics
Space weather modelling
UNBSSI follow-up projects in astronomy

International Scientific Organizing Committee (ISOC)

Amory - Mazaudier C., France
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Georgieva K., Bulgaria
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Shibata K., Japan
Yumoto K., Japan

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Ishitsuka J., Perú
López E. (Chair)
Semanate J.
Vásconez C. (Co-Chair)
Vásquez N. (Co-Chair)
Vicente K.

Quito - Ecuador

October, 8th to 12th, 2012

Organized by:

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SECTION 1

BACKGROUND:

Initiated in 1990, the United Nations Basic Space Science Initiative (UNBSSI) has contributed to the international and regional development of astronomy and space science through annual workshops organized under the umbrella of the United Nations, focusing specifically on the International Heliophysical Year 2007 (IHY, 2005-2009) and the International Space Weather Initiative (ISWI, 2010-2012). UNBSSI has led to the establishment of planetariums, astronomical telescope facilities, and IHY/ISWI instrument arrays worldwide, particularly in developing nations. ISWI is envisioned to continue the tradition of IHY in the worldwide deployment of space weather monitoring instrument arrays. To date, ISWI contributes to the observation of space weather through 18 instrument arrays with close to 1000 operating instruments in more than 100 nations supported by designated national ISWI coordinators.

The first workshop on ISWI was held in Helwan, Egypt and hosted by the Helwan University, Egypt, in 2010, particularly for the benefit of nations in Western Asia. In 2011 the United Nations/Nigeria Workshop on ISWI was hosted by the Centre for Basic Space Science of the University of Nigeria at Nsukka, Nigeria, particularly for the benefit of nations in Africa. The third ISWI workshop was hosted by Ecuador in 2012 for the region of Latin America and the Caribbean.

VENUE

The workshop took place at the Quito Hotel, located in the Capital city of Ecuador. The talks, meetings, and poster presentation mostly took place within various halls reserved in the hotel premises, for convenience.

http://www.hotelquito.com/

PROGRAM

The detailed program is available below in the section 3 of this document.

The opening ceremony took place with the welcome remarks and participation of the following distinguished personalities: Dr. Fernando Cornejo, General Deputy Secretary of the Secretariat of Higher Education, Science, Technology and Innovation of Ecuador (Senescyt), Vice-Minister Dr. Marco Albuja in representation of the Minister of Foreign Affairs, Trade and Integration of Ecuador, Prof. Hans Haubold and Dr. Sharafat Gadimova of the United Nations Office for Outer Space Affairs (UOOSA), Prof. Joseph DAVILA from The National Aeronautics and Space Administration (NASA) of United States of America, Prof. Ericson Lopez, Chair of the UN/Ecuador Workshop and Director of Quito Astronomical Observatory, Prof. Hajime Hayakawa from Institute

of Space and Astronautical Science, JAXA, Japan and Ing. Alfonso Espinosa, Rector of National Polytechnic School of Ecuador.

The workshop closed on October 12st, 2012 with an emotive closing session in which was expressed the recognition to Professor Hans Haubold for his huge contribution to the development of Basic Space Science around the world. Also organizers and participants received congratulations for the successful realization of the 2012 UN/Ecuador Workshop on basis of the ISWI.

SUMMARY OF PARTICIPATION

In all about 73 participants from 20 countries attended the UN/Ecuador Workshop.

Countries of participants:

1. Argentina
2. Brazil
3. Bulgaria
4. Croatia
5. Ecuador
6. France
7. India
8. Indonesia
9. Israel
10. Japan
11. Kazakhstan
12. Morocco
13. Nigeria
14. Peru
15. Slovakia
16. Turkey
17. United Arab Emirates
18. United States of America
19. Uruguay
20. Viet Nam

SPONSORSHIP

UNOOSA, NASA and SENESCYT have provided the main resources for covering venue costs, international travels, accommodation, and feeding for most of participants during the time of realization of the Workshop. IAU, JAXA, SERC, CLAF, Kyushu University of Japan, Ministry of Foreign Affairs of Ecuador, Escuela Politecnica Nacional/Observatorio Astronomico de Quito have provided additional and necessary resources to ensure the successful realization of the UN/Ecuador Workshop.

We thank to each one of the contributors for the valuable support for the realization of this important scientific meeting.

INTERNATIONAL SCIENTIFIC ORGANIZING COMMITTEE (ISOC)

- Lopez, E., Ecuador [Chair]
- Gadimova, S., United Nations [Co-Chair]
- Gopalswamy, N., USA [Co-Chair]
- Amory-Mazaudier, C., France
- Chilingarian, A., Armenia
- Davila, J., USA
- Georgieva, K, Bulgaria
- Hayakawa, H., Japan
- Mahrous, A., Egypt
- Okeke P. N., Nigeria
- Rabiu, A.B., Nigeria
- Raulin, J.-P., Brazil
- Shibata, K., Japan
- Yumoto, K., Japan

LOCAL ORGANIZING COMMITTEE (LOC)

- Lopez, E. [Chair]
- Vasconez C. [Co-Chair]
- Vasquez N. [Co-Chair]
- Haubold, H.J., Germany
- Abedrabbo S.
- Espinosa A.
- Ishitsuka J., Perú
- Lasso O.
- Semanate J.
- Vicente K.

WEBSITES

- iswiecuador.epn.edu.ec
- oaq.epn.edu.ec/iswi

SECTION 2

ORAL PRESENTATIONS

A PATHWAY IDEA FOR MODEL BUILDING

Mr. Arak MATHAI, Centre for Mathematical
Sciences, India

HIGHLIGHTS OF THE 2012 WORKSHOP ON SOCIETAL IMPACTS OF SPACE WEATHER

Ms. Mangala
SHARMA, United States of America

SOLAR RADIO BURSTS AND SPACE WEATHER

Mr. Natchimuthuk GOPALSWAMY, National
Aeronautics and Space Administration, United States of America

MASATOSHI KITAMURA (1926 – 2012) AND HIS CONTRIBUTIONS TO THE UNITED NATIONS CTIVITIES

Mr. Takashi SAKURAI, Mr. Kazuhiro SEKIGUCHI and Mr. George MAEDA National Astronomical Observatory of Japan
International Centre for Space
Weather Science and Education, Kyushu University, Japan

ESTABLISHMENT OF INTERNATIONAL CENTRE FOR SPACE WEATHER SCIENCE AND EDUCATION (ICSWSE)

Mr. Akimasa YOSHIKAWA,Japan

ACHIEVEMENT DURING THE UNITED NATIONS BASIC SPACE SCIENCE INITIATIVE: INTERNATIONAL EQUATORIAL ELECTROJET YEAR (IEEY), IHY AND ISWI

Ms. Christine AMORY, France

THE ISWI WEBSITE AND THE ISWI NEWSLETTER: A SUMMARY REPORT

1D. Danov and 2G. Maeda
1Space Research and Technology Institute, Bulgarian Academy of Sciences, Block 3, Acad. G. Bonchev Street, 1113 Sofia, Bulgaria.
2International Center for Space Weather Science and Education, Kyushu University, SERC, Hakozaki Campus Hakozaki 6-10-1, Higashi-ku, Fukuoka 8128581, Japan

Abstract: The three-year international program called ISWI soon comes to an end (although it will continue in other forms) and so it is appropriate to summarize some of its results. Because of the global nature of ISWI, it was necessary to establish some channels of communications. ISWI had two: (1) the ISWI Website, and (2) the ISWI Newsletter. In this talk, we summarize some of the achievements of both. The website and newsletter effectively complemented each other.

SOLAR ENERGETIC PARTICLES: ORIGIN AND SPACE WEATHER RELEVANCE

1G. Trottet and K-L Klein
1Observatoire de Paris, LESIA-CNRS UMR 8109, Université P & M Curie and Paris-Diderot Observatoire de Meudon, 92195 Meudon, France

Abstract: Solar Energetic particles (SEP) are accelerated during flare-coronal mass ejection (CME) events. The accelerated particles (protons up to about 10 GeV and electrons up to about 100 MeV) both interact with the solar atmosphere, where they produce electromagnetic radiations, and escape to the interplanetary (IP) space, where they are detected in-situ by space borne instruments and, for the most energetic protons and neutrons, at the Earth's ground level (ground level events; GLE). SEP events are an important tool for the study of the Sun-Earth connection. Indeed, for example, when penetrating the Earth's magnetosphere they cause ionization in the ionosphere, which affects radio communications, and they constitute radiation hazard to spacecraft, astronauts and aircraft crews.

In this talk we first give a short and basic overview of the characteristics of SEP events, of the associated electromagnetic radiations, and of the coronal and IP transport of the particles. We also briefly present the effects of SEPs on the Earth's plasma environment and humans. The bulk of our presentation is devoted to discuss the long-standing question of the origin of SEP: acceleration due to magnetic energy conversion in the solar atmosphere associated with flares vs acceleration in the high corona and IP space by CME-associated shocks. Our discussion is based on statistical studies of combined SEP observations and associated electromagnetic signatures, on observational analyses of confinement in and escape from the corona of flare-accelerated particles, on quantitative work comparing the numbers and spectra of interacting and escaping particles and on timing relationships in detailed case studies. We conclude that there is, as of today, no argument that excludes the contribution of either flares or CME shocks to SEP acceleration. There is evidence that energetic electrons and relativistic protons detected in space are closely related to the flare, while the long durations of proton and ion enhancements in the 1-to-tens of MeV region suggest the contribution of long-lasting IP shock acceleration. We discuss how in situ SEP measurements close to the Sun, such as those that the Solar Orbiter (ESA) spacecraft will perform during the next solar cycle, could bring a more definitive answer. Combined observations with gamma-ray, hard Xray and radio instruments, as well as with relativistic particle detectors on the Earth (see www.nmdb.eu), will be a crucial complement to the success of this mission.

UPDATE ON MAGDAS ACTIVITIES SINCE THE LAST ISWI WORKSHOP

G. Maeda, K. Yumoto, T. Hada, H. Kawano, A. Yoshikawa, H. Liu, M. Watanabe,
S. Abe, T. Uozumi, A. Ikeda, M. Shinohara, M. Cardinal.
ICSWSE, Kyushu University, SERC Hakozaki, Campus Hakozaki 6-10-1 Higashi-Ku,
Fukuoka 812-8581, Japan

Abstract: The MAGDAS Project continues to expand and maintain its large network of magnetometers and handful of radar observatories. As well, the project is actively engaged in "Capacity Building" in developing nations. For example, a MAGDAS School is conducted each year -- last year it was conducted in Lagos, Nigeria. In this presentation, we highlight the MAGDAS activities between the 2011 ISWI Workshop (Nigeria) and the 2012 ISWI Workshop (Ecuador). The activities include three MAGDAS installations in Sumatra, one radar installation in Peru, and an "ISWI and MAGDAS School" in Bandung, Indonesia.

MAGDAS I AND II MAGNETOMETERS IN PERU

1**E.W. Choque,** 2J.K. Ishitsuka2, 3K. Yumoto and 4V. Oscar
1, 2,4Geophysical Institute of Peru, Peru
3 Space Environment Research Center, Kyushu University, Japan
4Jicamarca Radio Observatory

Abstract: The Department of Terrestrial Magnetism of Carnegie Institution of Washington have established in 1919 the Huancayo Observatory, Peru (Lat. -12.06º, Long -75.21º) and installed a classical magnetometer which have provided a long standing of data since March 1, 1922 to present. Actually in Peru are in operation 10 magnetometers. On 13 October 2006 Space Environment Research Center - SERC of Kyushu University installed a new Magnetic Data Acquisition System MAGDAS I (PI; Prof. K. Yumoto) at Ancon Observatory (Geographic Latitude: -11.79º, Longitude: - 77.16º and Geomagnetic Latitude(2000): 3.10º and Longitude(2000): 354.66º). On 13 July 2011 SERC installed a MAGDAS II at Ica Solar Station (Geographic Latitude: - 14° 04', Longitude: -75° 44').

CASE STUDY ON MANADO EARTHQUAKES IN 2008 USING POLARIZATION METHOD AND COMPARATION BETWEEN TWO MAGDAS/CPMN OBSERVATORIES

F. Nuraeni
Space Science Center Indonesia National Institute of Aeronautics and Space (LAPAN),
Jl. Dr. Djundjunan No. 133A, West Java, Bandung 40173 Indonesia

Abstract: ULF geomagnetic pulsation anomaly appears before large scale earthquake has been studying using variety of methods. It is because the anomaly of ULF geomagnetic signal can be caused by global external disturbance or local internal disturbance. In this paper, polarization method (Z/H) and its comparison between 2 observatories are being used to estimate whether the anomaly is caused by external or internal disturbance. Earthquakes that has occurred around Manado observatory in 2008 with magnitude > 5 S.R and the epicenters distance are <200 km as case study.
Pontianak is being used as reference station. From the case study we found out that the ULF signal anomalies associated with the earthquakes and it is appeared 3 weeks to 10 days before the earthquakes happened.

VARIABILITY OF SPACE WEATHER OVER AFRICA FROM IHY/ISWI OBSERVATIONAL FACILITIES BETWEEN 2006 AND 2012

A.B. Rabiu
National Space Research & Development Agency, NASRDA, Abuja, Nigeria
Space Physics Laboratory, Physics Department, Federal University of Technology, Akure, Nigeria

Abstract: Geomagnetic activity and ionospheric variability are strong proxies of space weather. IHY and ISWI programs facilitated deployment to Africa of instruments capable of monitoring space weather from 2006 to date. These equipment include over 14 Magnetometers and more than 15 GPS receivers. This paper presented results of analyses conducted on data obtained from these facilities. The data were supplemented with others obtained from other experimental campaigns. Space weather is observed to be very dynamic over Africa. Temporal and continental-spatial variation of Solar quiet daily Sq variation in the three geomagnetic field components H, D and Z have been investigated. H field experienced more variation within the Equatorial Electrojet zone. Levels of interrelationships between the Sq and its variability in the three components were statistically derived and interpreted in line with the mechanisms responsible for the variations of the geomagnetic field. Signature of the Equatorial Electrojet over the African sector was identified and examined. The flow gradient of EEJ along the African sector was estimated and its diurnal variation studied. The EEJ appear stronger in East than West Africa. Flow gradient do not follow a definite diurnal pattern. There is clear indication that equatorial ionosphere exhibits longitudinal variability over Africa. The latitudinal extent of induction effects was also examined. There exists variation in electromagnetic inductive from one latitude to another. Fluctuations in TEC were more in daytime than night time. This is attributed to the daytime influence of solar activity on the ionization within the ionosphere. Rate of change of TEC and its fluctuation, measured as ROTI, were investigated. ROTI proved to be a good proxy of ionospheric scintillation.

MAGDAS MAGNETOMETER: AN ECUADOR/JAPAN COLLABORATION

Christian Vasconez ,Ericson Lopez and Kleber Vicente
Quito Astronomical Observatory, Escuela Politecnica Nacional
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Abstract: MAGDAS project is a ground-based network of magnetometers, which complements observations from space of the earth's magnetic field. In order to study the dynamics of geospace plasma changes during magnetic storms and auroral substorms; the electro-magnetic response of iono-magnetosphere variations with solar winds; and the penetration and propagation mechanisms of DP2-ULF range disturbances from the solar wind region into the equatorial ionosphere. In Ecuador, we chose the Jerusalen national reserve to install this magnetometer. This location is close to the equatorial line, 30km from Quito and away from electromagnetic noise sources.

GEOMAGNETIC STORM'S PRECURSORS OBSERVED WITH THE GLOBAL MUON DETECTOR NETWORK – GMDN

1M.R. Da Silva, 2A. Dal Lago, 2W.D. Gonzalez, 3K. Munakata, 3C. Kato, 4T. Kuwabara, 4J. Bieber, 5N.J. Schuch, 5M.L.Duldig, 6J.E. Humble, 7H.K. Al Jassar, 7SM.M. Sharma, and 8,9 I. Sabbah

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2National Institute for Space Research (INPE-MCT), São José dos Campos – SP, Brazil;

3Department of Physics, Shinshu University, Matsumoto, Japan;

4Bartol Research Institute and Department of Physics and Astronomy, University of Delaware, Newark, USA;

5Southern Regional Space Research Center (CRS/CCR/INPE-MCT), Santa Maria, RS, Brazil;

6School of Mathematics and Physics, University of Tasmania, Hobart, Australia;

7Physics Department, Kuwait University, Kuwait 13060.;

8Department of Natural Sciences, Collage of Health Sciences, the Public Authority of Applied Education and Training, Kuwait;

9Department of Physics, Faculty of Science, University of Alexandria, Alexandria, Egypt.

Abstract: We use complementary observations from the prototype and expanded Global Muon Detector Network (GMDN) and the Advanced Composition Explorer (ACE) satellite to identify precursors of geomagnetic storm events. The GMDN was completed and started operation in March 2006 with the addition of the Kuwait detector, complementing the detectors at Nagoya, Hobart, and São Martinho da Serra. Analyzed geomagnetic storms sorted by their intensity as measured by the Disturbance storm-time (Dst) index. Between March 2001 and December 2007, 122 Moderate Storms (MS), 51 Intense Storms (IS), and 8 Super Storms (SS) were monitored by the GMDN. The major conclusions are (i) the percentage of the events accompanied by the precursors prior to the Sudden Storm Commencement (SSC) increases with increasing peak Dst, (ii) 15% of MSs, 30% of ISs, and 86% of SSs are accompanied by cosmic ray precursors observed on average 7.2 hours in advance of the SSC.

INTERACTION BETWEEN ICMES AND FORBUSH DECREASE: A CASE STUDY OF THREE MULTIPLE ICME EVENTS

1D. Maričić, 2M. Dumbović, 2S. Lulić, 3B. Vršnak, 3T. Žic, 2J. Čalogović, 1D. Roša, 1D. Hržina, 1I. Romštajn, 5K. Salamon, 3M. Temmer, 3T. Rollett, 3A. Veroni, 4N. Bostasyan, 4A. Chilingaria, 4B. Mailyan, 4K. Arakelya and 4A. Hovhannisyan
1Astronomical Observatory Zagreb, Opatička 22, HR-10000 Zagreb, Croatia 2Hvar Observatory, Faculty of Geodesy, Kačićeva 26, HR-10000 Zagreb, Croatia
3IGAM/Institute of Physics, University of Graz, Graz, Austria
4Cosmic Ray Division, Yerevan Physics Institute,
Alikhanyan Brothers St. 2, Yerevan 36, Armenia
5Institute of Physics, Bijenčka cesta 46, HR-10000 Zagreb,Croatia

Abstract: The three-year international program called ISWI soon comes to an end (although it will continue in other forms) and so it is appropriate to summarize some of its results. Because of the global nature of ISWI, it was necessary to establish some channels of communications. ISWI had two: (1) the ISWI Website, and (2) the ISWI Newsletter. In this talk, we summarize some of the achievements of both. The website and newsletter effectively complemented each other.

STUDIES OF TEC IN ECUADOR USING GLOBAL POSITIONING SYSTEM (GPS) DATA

David Andrade and Ericson Lopez
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The ionosphere is a region of the atmosphere formed by ions, which is located between 300 and 500 km of altitude. The ion concentration in this layer is affected by interactions with particles arising from the solar activity. Parameters such as latitude, longitude, time, solar cycle, ground stations, and others influence the content of ions present in this region. The ionosphere disturbs the electromagnetic signals, due to its conductivity and high variability. In this research, signals from Global Positioning System (GPS) were used, to estimate the total electron content (TEC) of the equatorial ionosphere, with data from the IGS network, based on dual-frequency receivers. Furthermore, we discuss a model that we employed to estimate the TEC, considering the variations experienced by signals as they propagate through the atmosphere and instrumental systematic errors.

IONOSPHERIC EFFECT IN GNSS PRECISE POSITIONING APPLICATIONS

M. Bouziani
Department of Geodesy, Surveying and Topogeodesie, Geomatic School, Agronomic Institute (IAV) Hassan II, BP 6202, Institutes, Rabat 10101, Morocco

Abstract: In geodesy, atmospheric effects are the main limitation to the accuracy and the reliability of specific GNSS-based applications. Accordingly, the use of GNSS for the determination of positions for applications where expected precision is about few centimeters or less, requires the correction of the effects of the atmosphere on GNSS signals. Space weather accounts for the most substantial errors experienced by the users of GNSS signals. It is the largest contributor to the single-frequency positioning error budget, and a significant factor for differential positioning.

GNSS satellite signals are affected by the neutral atmosphere and ionized atmosphere. Their influences are especially known as the tropospheric effect and the ionospheric effect. A better consideration of these effects in the GNSS data processing algorithms requires a better knowledge of the Total Electron Content (TEC) of the ionosphere and neutral atmosphere water vapor content. In our case, we will focus on the ionospheric effect in precise positioning using GNSStechniques. Positioning satellite systems have become valuable tools for many applications of positioning and navigation but also for studies of the ionosphere and meteorology. The ionospheric effects cause range errors, rapid phase and amplitude fluctuations of satellite signals that may lead to degradation of the system performance, its accuracy and reliability. For scientific and civilian applications of GNSS requiring precise results in real time, the ionospheric error has a significant influence on data processing techniques, in particular, on the resolution of phase ambiguities. An approach to study and correct these effects will be described.

We will also discuss how the development of other satellite constellations GLONASS, Galileo and Compass in addition to GPS have raised awareness of the international GNSS community's need to know the condition of the ionosphere that affects GNSS systems. A case study in Morocco of assessment of ionospheric affects through the use of GNSS Permanent Stations Network will be presented and the prospects of research in ionospheric affects related to the proliferation and modernization of the satellite positioning constellations will be discussed.

GNSS AND SPACE WEATHER

Mr. Noah BROSCH, Israel

ISWI AND AWESOME PROJECT IN VIETNAM

L. Hoang Thai
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Ho Chi Minh City Institute of Physics, VAST,
01 Mac Dinh Chi Street, 1st District, Ho Chi Minh City 70000, Viet Nam

Abstract: The presentation is an overview of the activities of IHY/ISWI programs in Vietnam. With a special geographical position is stretching from the North tropic to the magnetic equator in one longitudinal zone and it is also the mainland zone adjacent to the Pacific Ocean, Vietnam is an interesting area to supplement the data for Global Space Weather Model. The Ionosphere is an important indicator of Space Weather. We will focus to the Ionospheric Scintillation and TEC results using GPS data and the comparison with HF data obtained in Vietnam. An AWESOME VLF Receiver was installed and monitoring continuously from November 2011 in Nha Trang, Vietnam. In Vietnam (and perhaps as well as in other developing countries), the International cooperation monitoring through the Internet is a new form. For this reason, how to maintain the instruments in good working and get quality data maybe a needed question. From the view of a coordinator I would like to exchange opinions for improvement the coordination between the Instrument Leaders and coordinators/host scientists.

TRANSIENT EVENTS ON THE SUN OBSERVED IN VLF, SOFT X-RAY AND FUV

1E. Macotela, 2J.-P. Raulin and 1W. Guevara
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San Isidro, Lima, Peru
2Centro de Radio Astronomía e Astrofísica Mackenzie (CRAAM), Brazil

Abstract : Changes in the transient solar activity are registered as changes in the VLF signal, soft X-ray flux and FUV flux. To found these changes we use data from SAVNET, GOES and LYRA/PROBA2. We show the events that was found in the data in the period of time from January, 2010 to March, 2010 and the possible relation between them.

SAVNET: UPGRADES, NEW RESULTS AND PERSPECTIVES

Jean Pierre RAULIN, Brazil

A NEW SOUTH AMERICA INSTRUMENTAL NETWORK FOR THE MONITORING OF THE ATMOSPHERIC ELECTRIC FIELD

Mr. Jean Pierre RAULIN, Brazil

EFFECTS AND EVIDENCES OF GEOMAGNETIC DISTURBANCESAND SOLAR PARTICLE EVENTSON THE LOWER IONOSPHERE PLASMA USING NARROWBAND VLF MEASUREMENTS AT LONG PATHS

1F.C.P. Bertoni and 2J.-P Raulin
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Abstract: The South America VLF Network (SAVNET) is a project which has been involved in the International Heliophysical Year activities (2004-2009) and since then, in the International Space Weather Initiative (ISWI) program. We use VLF narrowband measurements made at long paths, in order to study the impacts on the upper atmosphere caused by solar x-ray flares and energetic particles emissions that have occurred during the year 2011, a moderate solar activity period. Comparing phase and amplitude variations, obtained during quiet and disturbed days conditions, and using x-ray flux measurements by GOES 15, it has been noticed that phase exhibited unusual values that were associated with excesses of ionization in the lower ionosphere plasma, along with some evidences of the effects caused by solar particle events.

MONITORING THE GEOMAGNETIC FIELD UNDER THE SOUTH ATLANTIC MAGNETIC ANOMALY

1,2L. Sánchez Bettucci, 3,2G. Tancredi, 2R. Caraballo, 1,2P. Núñez and 2Rafael Ogando1
1,2Area Geofísica-Geotectónica, Instituto de Ciencias Geológicas,
Facultad de Ciencias, Universidad de la República
2Observatorio Astronómico y Geofísico de Aiguá
3Departamento de Astronomía, Instituto de Física, Facultad de Ciencias, Universidad de la República/Observatorio Astronómico Los Molinos, DICYT – MEC

Abstract: Uruguay is located close to the center of the South Atlantic Magnetic Anomaly (SAMA), a region where the values of the total magnetic field reach its minimum. Under this region, the exposure to hazardous cosmic is several orders of magnitudes more intense than in any other region of the planet, at least at a few hundred km. above the surface, as it has been measure from many orbiting satellites. At ground level the effect of this anomaly are less known. The solar storms can produce geomagnetic storms with important variation of the strength of the magnetic field; which it could have consequences for the tele- and radio-communications, induced currents in power lines and long pipelines, and even in several biological species.

The monitoring of the variation of the magnetic field in this critical region of the planet is relevant for the understanding of the consequences of the geomagnetic storms in our civilization.

We have been performing continuous measurements of the total intensity of the magnetic field from a new facility: the Observatorio Astronómico y Geofísico de Aiguá (OAGA). It is located at -34° 20 ‘0.89” S/-54° 42’ 44.72” W, h: 270m. From February 2011, we have used a protonic magnetometer G856 Geometrics. The measured values of total intensity of the magnetic field are the lowest compared to any geomagnetic observatory in the world. In the near future the OAGA will have also a magnetometer GSM-90F5D Overhauser dIdD and a GSM-90 v7.0 T Overhauser EUROMAG Magnetometer (GEM Systems).

We will present the results of the first long-term monitoring of the magnetic field at a location very close to the center of the SAMA.

SPACE WEATHER RESEARCH IN KAZAKHSTAN

Zh. Zhantayev, 2B. Zhumabayev, 2O. Kryakunova
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Shevchenko, 15, Almaty, Kazakhstan
2Institute of Ionosphere, Republic of Kazakhstan, 050020,
Kamenskoe plato, Almaty, Kazakhstan

Abstract: In Kazakhstan there is an experimental complex for space weather study and forecasting. This complex is situated near Almaty (Kazakhstan). It includes an experimental setup for records of cosmic ray intensity (neutron monitor) at the altitude of 3340 m above sea level, the magnetic observatory «Alma-Ata», an optical interferometer SATI for recording the emission of night sky, an ionospheric sounder and solar radio telescope. Nowadays the measurements of the solar radio flux at frequencies of 1.078 GHz and 2.8 GHz (10.7 cm) are carries out on the regular basis with 1 second time resolution.

Type II solar radio bursts are currently one of the main observable precursors of CMEs that will arrive at Earth within a few days after bursts. In view of future upgrade of the «Orbita» ground regarding new radio astronomical instruments, a measurement campaign was planned and organized between Institute of ionosphere, «NCSRT» and ETH Zurich, supported by SSAA. A new Callisto radio spectrometer (eC37) was installed and configured while the «Orbita» ground station. Results of space environment monitoring in real time are accessible via Internet. This experimental information is used for space weather investigation and different cosmic ray effects study. Almaty mountain cosmic ray station is one of the most suitable and sensitive stations for investigation and forecasting of the dangerous situations. Almaty cosmic ray station is included in the world-wide neutron monitor network for the real-time monitoring of the space weather conditions and European Database NMDB (www.nmdb.eu). The magnetic observatory «Alma-Ata» is a member of INTERMAGNET programme, contributing data for computation of the Dst index. All data are represented on the web-site of the Institute of Ionosphere (www.ionos.kz) in real time. Since July, 2006 the space environment prediction laboratory represents the forecast of geomagnetic activity every day on the same site (www.ionos.kz/?q=en/node/21).

GEOMAGNETIC EFFECTS ON COSMIC RAY PROPAGATION UNDER DIFFERENT CONDITIONS FOR MALARGUE CITY, ARGENTINA

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Abstract: The geomagnetic field (Bgeo) sets a lower cutoff rigidity (Rc) to the entry of cosmic particles to the Earth which depends on the geomagnetic activity. From numerical simulations of the trajectory of a proton (performed with the MAGCOS code) in the Bgeo, we use backtracking to analyze particles arriving at the Auger Observatory location.
We determine the asymptotic trajectories and the values of Rc in different incidence directions. Simulations were done using several models of Bgeo and emulating different conditions for the geomagnetic activity.

EFFECTS OF HYSTERESIS BETWEEN MAXIMUM CME SPEED INDEX AND GEOMAGNETIC ACTIVITY INDICATORS DURING SOLAR CYCLE 23

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2Bear Solar Observatory, Big Bear City, CA 92314, USA

Abstract: Using the smoothed time series of maximum CME speed index data set for solar cycle 23, it is found that this index, analyzed jointly with two geomagnetic indices, show a hysteresis phenomenon. It is observed that Ap and Dst indices follow different paths for the ascending and the descending phases of solar cycle 23, while a saturation effect exists at the maximum phase of the cycle. However it is noticed that the separations between the paths are not the same for the geomagnetic activity indicators used. Lag times with respect to the maximum CME speed index is discussed, confirming that hysteresis represents a clue in the search for physical processes responsible for changing solar emission.

ADVANTAGES OF ANDES MOUNTAINS TO HIGH ENERGY COSMIC STUDIES

Nicolás Vásquez
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Abstract: The development of astronomical sciences in Latinamerica has encountered some difficulties, and the participation of the region is limited in the international scientific community. In an effort to participate actively in the development of space related sciences, we present some projects that considering the geographical situation of the latin countries could be consider for its operation. Andes Mountains are an important geographical feature of Latin american countries. The high altitude lands offer the possibility to reduce the detector size and reach energy detection bands that have not yet been explored. We discuss the advantages of location of easy accessibility over 4000 meters over the sea level for cosmic ray studies and solar monitoring.

CURRENT STATUS OF THE FLARE MONITORING TELESCOPE (FMT) AT PERU OF THE CHAIN PROJECT, AND A REPORT OF SCIENTIFIC RESEARCH AND TRAINING IN SOLARPHYSICS FOR YOUNG PERUVIAN FUTURE RESEARCHERS

1S. Morita, 1S. Ueno, 1K. Shibata, 2A. Asai, 1R. Kitai, 1G. Kimura, 3J. Ishitsuka, 4R. Terrazas, 3D. Cabezas, 3V. Gutierrez, 4L. Martinez, 4Y. Buleje, 4R. Loayza, 1N. Nakamura, 1Sh. Takasao, 1Y. Yoshinaga, 1A. Hillier, 5K. Otsuji, 3M. Ishitsuka, 1T. Ishii, 1K. Ichimoto, 1Sh. Nagata, 6N. Narukage
1Kwasan and Hida Observatories, Kyoto University, Kurabashira, Kamitakara, Takayama, Gifu 506 1314, Japan
2Unit for Synergetic Studies of Space, Kyoto University, Japan
3Geophysical Institute of Peru (IGP), Peru
4San Luis Gonzaga de Ica National University (UNICA), Peru
5National Astronomical Observatory of Japan (NAOJ), Japan
6Japan Aerospace Exploration Agency (JAXA), Japan

Abstract: The Flare Monitoring Telescope (FMT) is a telescopes system to observe the solar chromosphere across the full disk. The FMT acquires three narrow-band filter grams in H-alpha (line center, and its red and blue wings), simultaneously every 20 seconds. A combination of the filter grams allows us to derive a Doppler map of the solar chromosphere with the same cadence. In March 2010, the FMT was moved into the Solar Station at the San Luis Gonzaga de Ica National University (UNICA), Peru, after its seventeen years operation at the Hida observatory, Kyoto University, Japan. Since then, the FMT has been operated by local

young Peruvians under an international collaboration for the Continuous H-alpha Imaging Network (CHAIN) between the Kyoto University, the Geophysical Institute of Peru (IGP), and the UNICA. The training in solar physics for the local young people is crucial for the success of this project since the daily operation of the FMT is performed by them. Thus we have continuously made efforts in this area. In the same year after the installation of the FMT, we sent a solar physicist to Peru for training in solar physics for young Peruvians for total three months. The 1st FMT workshop was opened in Peru at the end of this period. Then in July 2011, the 2nd FMT workshop was opened in Japan with inviting five young Peruvians. The data analyses in this workshop were made by those young Peruvians. We are working on publications with the results of this 2nd workshop. Details of the successful collaborations will be explained in this presentation.

"INTERNATIONAL COLLABORATION AND ACADEMIC EXCHANGE OF THE CHAIN PROJECT IN RECENT ONE YEAR"

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A**bstract:** We will introduce contents of international collaboration and academic exchange of the CHAIN project in recent one year. After April of 2010, we have not obtained any enough budget for new instruments. Therefore, we have not been able to install new Flare Monitoring Telescopes (FMT) in new countries, such as Algeria.
On the other hand, however, we have continued international academic exchange through scientific and educational collaboration with mainly Peru, such as data-analysis training, holding scientific workshops etc. Additionally, in this year, King Saudi University of Saudi Arabia has planned to build a new FMT in their university by their own budget. Therefore, we have started some collaboration in the field of technical advices of instruments and scientific themas etc. Moreover, Pakistan Space and Upper
Atmosphere Research Commission (SUPARCO) also offered us participation in the CHAIN-project. We would like to continue to consider the possibility of academic collaboration with such new positive developing nations.

“CHAIN-PROJECT: INVESTIGATIONS OF SOLAR ACTIVE PHENOMENON OBTAINED WITH FLARE MONITORING TELESCOPE (FMT)”

1D.P. Cabezas, 2L.M. Martínez, 3Y.J. Buleje, 1M. Ishitsuka, 1J.K. Ishitsuka, 4S. Takasao, 4Y. Yoshinaga, 4A. Asai, 4S. Morita, 4S. Ueno, 4T.T. Ishii, 4R. Kitai and 4K. Shibata
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Abstract: Coronal disturbance associate with solar flares, such as H-alpha Moreton waves, X-ray waves, EIT/EUV waves, have been discussed in relation to MHD fast mode waves or shocks in the corona. The knowledge of structures, velocities and their evolution are crucial for understanding variations of space weather. Using H-alpha full disk images taken by FMT1 relocated from Hida Observatory of Kyoto University to Ica National University in Peru under the international collaboration of the CHAIN2-Project, we observed a filament eruption, associated with the solar flare that occurred on 2011 February 16 at the active region NOAA 11158. There is no Moreton wave observed in Halpha, while we identify oscillations/activations of Hα filaments (winking filaments) at distance locations of flare site. In the extreme ultraviolet data taken by the AIA3 on board SDO4 and EUVI5 on board the STEREO6-Ahead satellite we clearly see coronal waves as well filament eruption. In this paper we present of the results of detailed examination of the eruption, winking filament and coronal waves.
1Flare Monitoring Telescope,2 Continuous H-alpha Imaging Network, 3Atmospheric Imaging Assembly, 4Solar Dynamic Observatory, 5Extreme-Ultraviolet Imager, 6Solar TErrestrial Relations Observatory

WITHIN THE INTERNATIONAL COLLABORATION CHAIN: A SUMMARY OF EVENTS OBSERVED WITH FLARE MONITORING TELESCOPE (FMT) IN PERU

1J. Ishitsuka, 2A. Asai, 3S. Morita, 6R. Terrazas, 1D. Cabezas, 1V. Gutierrez, 6L. Martinez, 1Y. Buleje, 3N. Nakamura, 3Sh. Takasao, 3Y. Yoshinaga, 3A. Hillier, 4K. Otsuji, 4K. Shibata, 1M. Ishitsuka, 3S. Ueno, 3R. Ktai, 3T. Shii, 3K. Ichimoto, 3Sh. Nagata and 5N. Narukage.
1 1Geophysical Institute of Peru (IGP), Peru
2Unit for Synergetic Studies of Space, Kyoto University, Japan
3Kwasan and Hida Observatories, Kyoto University, Japan

4National Astronomical Observatory of Japan (NAOJ), Japan
5Japan Aerospace Exploration Agency (JAXA), Japan
6San Luis Gonzaga de Ica National University (UNICA), Peru

Abstract: In 2008 we inaugurated the new Solar Observatory in collaboration with Faculty of Sciences of San Luis Gonzaga de Ica National University, 300 km south of Lima. In March of 2010 a Flare Monitoring Telescope of Hida Observatory of Kyoto University arrived to Ica, part of CHAIN (Continuous H-alpha. Imaging Network) Project. In October of the same year we hosted the First FMT Work Shop in Ica, then in July of 2011 the Second FMT Work Shop was opened. Since that we are focused on two events registered by FMT in Peru to publish results. FMT is a good tool to introduce, young people from universities, into scientific knowledge, also is good for education in Solar Physics and outreach. Details of this successful collaboration will be explained in his presentation.

A 3-DIMENSIONAL VIEW OF THE FILAMENT ERUPTION AND CORONAL MASS EJECTION ASSOCIATED WITH THE 2011 MARCH, 8 SOLAR FLARE

Ms. Maria GUTIERREZ, Peru

SOLAR RADIO SPECTROMETER CALLISTO IN HURBANOVO (SLOVAKIA) – FIRST RESULTS

I. Dorotovic, T. Pinter,
Slovak central Observatory, Hurbanovo, Slovak Republic

Abstract : During the 2011 UN/Nigeria Workshop on ISWI we presented a poster on 'SID Monitoring in Slovakia'. In December 2011 was installed a the solar radio spectrometer CALLISTO in the Slovak Central Observatory in Hurbanovo, in the frame of the ISWI instruments deployment program. The spectrometer registers solar radio radiation by using broadband log-periodic antenna CLP-5130-2N in the range of frequencies from 45 to 870 MHz. This contribution presents the observing site of the instrument and the first results.

CREATION OF THE NEW ECUADORIAN SPACE PHYSICS DIVISION

Ericson D. Lopez
Observatorio Astronómico de Quito, Escuela Politécnica Nacional,
Interior del Parque La Alameda,
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Abstract: The development of sciences in great part depends on the available facilities and its adequate organization. In this way, an initial and reliable propel must be done for introducing a new kind of research inside an academic community.
Crucial physical phenomena occur in the equatorial atmosphere and ionosphere, which are currently understudied and poorly understood. Then, scientific campaigns for monitoring equatorial region are required, which will provide the data for analyzing and creating adequate models.
Ecuador, is located in strategic geographical position where this studies can be performed, providing data for the scientific community working for understanding the nature of these physical systems. The Quito Astronomical Observatory of National Polytechnic School is working in this direction, promoting research in Space Sciences for studying the equatorial zone. With the participation and valuable collaboration of international initiatives like AWESOME, MAGDAS, SAVNET and CALLISTO, the Quito Observatory is creating a NEW SPACE PHYSICS DIVISION on basis of the International Space Weather Initiative.
In this contribution, the aforementioned initiative is presented inviting leaders of others scientific projects to deploy their instruments and to join us giving the necessary support for the creation of the New Division.

SPACE WEATHER MONITORING CENTRE OF EGYPT: RECENT CONSEQUENCES AND FUTURE PROSPECTS

A. Mahrous
Space Weather Monitoring Center, Faculty of Science,
Helwan University, Ain Helwan, 11795 Egypt

Abstract: As part of the ISWI strategy to increase the space weather applications and instrumentation in Africa, Helwan University has established the Space Weather Monitoring Centre (SWMC) in Helwan, Egypt. The Center was founded in 2007 to support the Egyptian Space Programme through monitoring and forecasting space weather. SWMC includes twenty five researchers working in four research groups in the fields of the ionosphere, geomagnetism, solar physics and cosmic rays. The center
comprises several instruments and monitoring stations through many joint international projects with USA (SCINDA, SID and three CIDRs) , Japan (two MAGDAS stations FYM&ASW), Switzerland (CALLISTO) and CERN (RPC cosmic ray muon detector). We present here some

recent remarkable results of several instruments and discuss the future prospects of the centre.

SOLAR SYSTEM SCIENCE WITH HUBBLE SPACE TELESCOPE (HST)

Ms. Susana DEUSTUA,
Space Telescope Science Institute, USA

Abstract:

The collection of Hubble Space Telescope Solar System observations taken by the now decommissioned Wide Field and Planetary Camera 2 (WFPC2) is enormous with about 10,000 individual exposures taken over 15 years. It includes long-term monitoring of planetary surfaces and atmospheres, targeted and serendipitous observations of moons, and many comet targets-of-opportunity. Some of these observations were taken to support the planning of other NASA and ESA planetary missions, and to complement the data they obtain. The standard HST data pipelines, which calibrate and combine images, are largely optimized for the processing of fixed-target data. Moving-target data cannot be simply combined and cleaned, due to the rapid motion and rotation of the targets. New multi-extension FITS formats and recent improvements to basic WFPC2 calibrations means that the entire data set can now be reduced better than ever before. We have been developing a planet pipeline to produce a truly science-ready collection of WFPC2 Solar System imaging data.
Our final data products will be incorporated into the Mikulski Archive for Space Telescopes (MAST), as High Level Science Products (HLSP). While we will conduct new scientific analyses of our own, we expect our data products to enable a wide range of analyses by other researchers for many years to come, and form an essential piece of Hubble's archival legacy.

THE SINAI OBSERVATORY, A CENTRE OF EXCELLENCE FOR THE REGION OF WESTERN ASIA

Mr. Noah BROSCH, Israel

ISWI SCIENCE PROGRAMME COORDINATION

Mr. David WEBB, United States of America

POSTER PRESENTATIONS

POSTER 1

CRITICAL PHENOMENA OF RAINFALL IN ECUADOR

Sheila Serrano, Nicolás Vásquez and Leonardo Basile

1. Centro de Investigacion en Modelamiento Ambiental CIMA, Universidad Politecnica Salesiana, Av. 12 de Octubre N24 22 y Wilson. Telf 593 095759915 Maestría en Fìsica.
2. Escuela Politécnica Nacional, Ladron de Guevara E11-253, Telf: (593-02) 2- 507 – 126, Observatorio Astronómico de Quito, Interior del Parque de la Alameda, entre Av. Gran Colombia y 10 de Agosto, Telf: (593)(02) 257 0765.

Abstract: Self organized criticality (SOC) is characterized by a power law behavior over complex systems like earthquakes and avalanches. Our research study found this phenomenon using high resolution data from the Tropical Rainfall Measure Mission (TRMM) over the Ecuadorian Amazonian region, taking account four years of precipitation with a spacial resolution of 0.25ºx0.25º and 3 hours of temporal resolution. Our results shown that the number of rain events against size obeys a power law behavior with an universal exponent. This statistical property is the fingerprint of a self-organized critical process and may serve as a benchmark for models of precipitation based only in dynamics processes.

POSTER 2

EXTREME SOLAR RADIATION IN QUITO ASTRONOMICAL OBSERVATORY USING EXTREME VALUE THEORY

Gabriela Chico and Oscar Lasso
Quito Astronomical Observatory, Escuela Politecnica Nacional

Abstract: We studied extreme values (outliers) on solar radiation data registered in Quito Astronomical Observatory (OAQ). From January 2010 to December 2011, in order to determinate the corresponding distribution function. Then we could propose a model to predict any possible radiation atypical behavior. We based this research on extreme-value-theory distributions of Gumbel, Frechet and Weibull complementary with the Generalized Extreme Value Distributions (GEVD). Data was filtered in a daily scheme from maximum levels of Minimal Erythema Dose (MED), from 280 to 400nm. Estimated parameters of these distributions will allow to obtain maximum likelihood of radiation in a subsequent period.

POSTER 3

A SOLAR FLARES MODEL. VARIATIONAL SOLUTIONS

Marco Calahorrano
Departamento de Matemática, Facultad de Ciencias, Escuela Politécnica Nacional, Av. Ladrón de Guevara E11-253, Quito, Ecuador, marco.calahorrano@epn.edu.ec, www.epn.edu.ec

Abstract: We use some variational techniques in order to solve nonlinear elliptic partial differential equations arising from solar flares model.

POSTER 4

AWESOME AND SAVNET EQUIPMENTS IN ECUADOR

Klever Vicente and Ericson Lopez
Quito Astronomical Observatory, Escuela Politecnica Nacional

Abstract: Monitoring the D-layer of the ionosphere has been proved to be valuable in fields of atmospheric sciences such as, meteorology, seismology and its relations. Stanford University

started the AWESOME Collaboration in order to build a global network of Very Low Frequency (VLF) (100Hz – 0 kHz) research. Ecuador, as a member of this project, began installing one research-quality VLF radio receiver in October 2010, inside the facilities of Quito Astronomical Observatory. However, after a year of data acquisition, we obtained low signal to noise ratio data, suggesting a pure environmental noise component. Currently, this VLF receiver is located at the Escuela Politecnica Nacional campus, but its optimal operation is still in study. We propose two alternatives to improve the quality signal. First, modify the antenna-preamplifier coupling circuits. Second, relocate the receiver in a low background noise location, such as Jerusalen Park.

POSTER 5

SOLAR RADIO SPECTROMETER CALLISTO IN HURBANOVO (SLOVAKIA) – FIRST RESULTS

I. Dorotovic, T. Pinter,
Slovak central Observatory, Hurbanovo, Slovak Republic

Abstract: During the 2011 UN/Nigeria Workshop on ISWI we presented a poster on 'SID Monitoring in Slovakia'. In December 2011 was installed a the solar radio spectrometer CALLISTO in the Slovak Central Observatory in Hurbanovo, in the frame of the ISWI instruments deployment program. The spectrometer registers solar radio radiation by using broadband log-periodic antenna CLP-5130-2N in the range of frequencies from 45 to 870 MHz. This contribution presents the observing site of the instrument and the first results.

POSTER 6

INFLUENCE OF HIGH-SPEED STREAMS FROM CORONAL HOLES ON COSMIC RAY INTENSITY

Ms. Olga KRYAKUNOVA, Kazakhstan
Laboratory of Diagnostic and Prediction of Geophysical Conditions, Institute of Ionosphere

National Center of Space Research & Technology Kamenskoe Plato, Almaty 050020 Kazakhstan

INVITED PRESENTATIONS:

- Recommendations and observations of the United Nations/Austria Symposium on data analysis and image processing for space applications and sustainable development: Space weather, *Mr. Lorant GZARAN, United Nations Office for Outer Space for Outer Space Affairs*

- Stereoscopic 3D projections of Mitaka, an important tool to get people interested in Astronomy and Space Science in Peru, *Ms. Shiomi NEMOTE, Peru*

SECTION 3

THE FINAL PROGRAM

Monday, 8 October 2012	
09:00 - 10:00	Registration
10:00	**Opening Ceremony and Welcome Remarks**
10:00	▪ *Mr. Ericson LOPEZ, Chair of the Organizing Committees and Director of the Quito Astronomical Observatory, Ecuador*
	▪ *Minister of Foreign Affairs, Trade and Integration of Ecuador, Economist Ricardo Patiño or his delegated Vice-Minister Marco Albuja*
	▪ *Mr. Fernando CORNEJO, General Deputy Secretary of Secretariat of Higher Education, Sciences, Technology and Innovation of Ecuador (Senescyt)*
	▪ *Mr. Hans HAUBOLD and Ms. Sharafat GADIMOVA, United Nations Office for Outer Space Affairs*
	▪ *Mr. Joseph DAVILA, NASA, United States of America*
	▪ *Mr. Hajime HAYAKAWA, JAXA, Japan*
	▪ *Mr. Alfonso ESPINOSA, Rector of National Polytechnic School of Ecuador, Ecuador*
11:00	*Coffee Break*
11:20	**Key note adresses**[1]
11:20	▪ A pathway idea for model building, *Mr. Arak MATHAI, Centre for Mathematical Sciences, India*
11:50	▪ Highlights of the 2012 workshop on societal impacts of space weather, *Ms. Mangala SHARMA, United States of America*
12:20	▪ Solar radio bursts and space weather, *Mr. Natchimuthuk GOPALSWAMY,*

	National Aeronautics and Space Administration, United States of America
12:50	Masatoshi Kitamura (1926 – 2012) and his contributions to the United Nations activities, *Mr. Takashi SAKURAI, Mr. Kazuhiro SEKIGUCHI, National Astronomical Observatory of Japan, and Mr. George MAEDA, International Centre for Space Weather Science and Education, Kyushu University, Japan*
13:00	*Lunch Break*
14:00	**Presentation Session 1: Building Upon the Results of the Regional Workshops on Basic Space Science (BSS), International Heliophysical Year (IHY), and International Space Weather Initiative (ISWI)**
	Chairperson: Mr. Christian VASCONEZ, Ecuador *Rapporteur: Ms. Olga KRYAKUNOVA, Kazakhstan*
14:00	▪ The use of ISWI data for space weather forecasting, *Mr. Antti PULKKINEN, Catholic University of Americas and National Aeronautics and Space Administration, United States of America*
14:25	▪ Establishment of International Centre for Space Weather Science and Education (*ICSWSE)*, *Mr. Akimasa YOSHIKAWA, Japan*
14:50	▪ Achievement during the United Nations Basic Space Science Initiative: International Equatorial Electrojet Year (IEEY), IHY and ISWI, *Ms. Christine AMORY, France*
15:15	▪ The ISWI Website and ISWI Newsletter: A summary report, *Mr. Dimitar DANOV, Bulgaria*
15:40	▪ UNBSS 1991 – 2012, *Ms. Sharafat GADIMOVA and Mr. Hans HAUBOLD, United Nations Office for Outer Space Affairs*
16:00	*Coffee Break*
16:20	**Panel Discussion 1: Building upon the results of the regional workshops on basic Space Science (BSS), International Heliophysical Year (IHY), and International Space Weather Initiative (ISWI)** *Moderators: Ms. Sharafat GADIMOVA and Mr. Hans HAUBOLD, United Nations Office for Outer Space Affairs, and Mr. Ericson LOPEZ, Ecuador*
	▪ *Assess the practical benefits of the follow-up actions resulting from the past workshops held annually since 1991 and their contribution to capacity-building for sustainable development in the utilization of space science, as well as deploying instruments for the International Space Weather Initiative (ISWI);*

	▪ *United Nations-affiliated Regional Centres for Space Science and Technology Education (India, Jordan, Mexico/Brazil, Morocco, Nigeria), which also serve as the Information Centres for the International Committee on Global Navigation Satellite Systems (ICG) and the International Centre for Space Weather, Science and Education (ICSWSE), Japan.*
18:00	*Adjourn*
18:30	*Brindis (Toast), Ministry of Foreign Affairs of Ecuador*
Tuesday, 9 October 2012	
09:00	**Presentation Session 2: Instrument Arrays: Magnetometers - MAGnetic Data Acquisition System (MAGDAS)**
	Chairperson: Mr. Jose ISHITSUKA, Peru *Rapporteur: Mr. Jimmy MASIAS MEZA, Argentina*
09:00	▪ Update on MAGDAS activities since the last ISWI Workshop, *Mr. George MAEDA, Japan*
09:20	▪ MAGDAS I and II magnetometers in Peru, *Mr. Edwin Wilber CHOQUE, Peru*
09:40	▪ Case study on Manado Earthquakes in 2008 using polarization method and comparison between MAGDAS/CPMN observatories, *Ms. Fitri NURAENI, Indonesia*
10:00	▪ Variability of space weather over Africa from IHY/ISWI observational facilities between 2006 and 2012, *Mr. Babatunde RABIU, Nigeria*
10:20	▪ MAGDAS Magnetometer: an Ecuador/Japan collaboration, *Mr. Christian VASCONEZ, Ecuador*
10:40	Questions and Answers
11:00	*Coffee Break*
11:20	**Presentation Session 3: Instrument Arrays: Particle detectors and studies of Total Electron Content (TEC)**
	Chairperson: Mr. Nicolas VASQUEZ, Ecuador *Rapporteur: Ms. Maria GUTIERREZ, Peru*
11:20	▪ Geomagnetic storm's precursors observed with the global nuon detector

	network (GMDN), *Mr. Marlos DA SILVA, Brazil*		
11:40	▪ Interaction between ICMES and FORBUSH decrease: a case study of three multiple ICME, *Mr. Darije MARCIC, Croatia*		
12:00	▪ Studies of TEC in Ecuador using Global Positioning System (GPS) data, *David ANDRADE, Ecuador*		
12:20	▪ Ionospheric effect in global navigation satellite systems (GNSS) precise positioning applications, *Mr. Mourad BOUZIANI, Morocco*		
12:40	▪ GNSS and space weather, *Mr. Noah BROSCH, Israel*		
13:00	*Lunch Break*		
14:00	**Presentation Session 4: Instrument Arrays: Ionosphere - Atmospheric Weather Electromagnetic System for Observation Modelling and Education (AWESOME) and South Atlantic Very Low frequency Network (SAVNET)**		
	Chairperson: Mr. Babatunde RABIU, Nigeria *Rapporteur: Mr. Denis CABEZAS, Peru*		
14:00	▪ Solar energetic particles: origin and space weather relevance, *Mr. Gerard TROTTET, France*		
14:30	▪ ISWI and AWESOME projects in Vietnam, *Ms. Lan HOANG THAI, Vietnam*		
14:50	▪ Transit events on the Sun observed in VLF, soft X-Ray and FUV, *Ms. Edith Liliana MACOTELA, Peru*		
15:10	▪ SAVNET: Upgrades, new results and perspectives, *Mr. Jean Pierre RAULIN, Brazil*		
15:30	▪ Effects and advances of geomagnetic disturbances and solar particle events on the lower ionosphere plasma using narrow band VLF measurements at long path, *Mr. Fernando BERTONI, Brazil*		
15:50	Questions and Answers		
16:00	*Coffee Break*		
16:20	**Discussion Session 1 (Working Groups sessions in parallel):**		
	Working Group 1: Basic Space Science (BSS) *Chairperson:* *Mr. Noah BROSCH, Israel*	**Working Group 2: International Heliophysical Initiative (IHY)** *Chairperson:* *Mr. Hans. HAUBOLD,*	**Working Group 3: International Space Weather Initiative (ISWI)** *Chairperson:* *Mr. Joseph DAVILA,*

		United Nations Office for Outer Space Affairs	*United States of America*
18:00	*Adjourn*		
Wednesday, 10 October 2012			
09:00	**Presentation Session 5: Space Weather research: Case studies**		
	Chairperson: Mr. Mourad BOUZIANI, Morocco *Rapporteur: Ms. Fitri NURAENI, Indonesia*		
09:00	▪ Monitoring the geomagnetic field under the South Atlantic Magnetic Anomaly (SAMA), *Mr. Gonzalo TANCREDI, Uruguay*		
09:20	▪ Space weather research in Kazakhstan, *Ms. Olga KRYAKUNOVA, Kazakhstan*		
09:40	▪ Geomagnetic effects on cosmic ray propagation under different conditions for Malargue city, Argentina, *Mr. Jimmy MASIAS MEZA, Argentina*		
10:00	▪ Effects of hysteresis between maximum CME speed index and geomagnetic activity indicators during solar cycle 23, *Mr. Atila OZGUC, Turkey*		
10:20	▪ Advantages of Andes mountains to high energy cosmic studies, Mr. Nicolas VASQUEZ, Ecuador		
10:40	Questions and answers		
11:00	*Adjourn*		
11:20 – 18:00	**Technical Tour** *Mitad del Mundo site* *Visit to the Quito Astronomical Observatory* *Quito Tour Bus „QUINDETOUR"*		
Thursday, 11 October 2011			
09:00	**Presentation Session 6: Instrument Arrays: Solar telescope – Continues H Alpha Imaging Network (CHAIN) and Compound Astronomical Low-cost Low-frequency Instrument for Spectroscopy and Transportable Observatory (CALLISTO)**		

	Chairperson: Mr. David WEBB, United States of America *Rapporteur: Ms. Lan HOANG THAI, Vietnam*
09:00	▪ Current status of the flare monitoring telescope (FMT) at Peru of the CHAIN project, and a report of scientific research and training in solar physics for young Peruvian future researches, *Mr. Satoshi MORITA, Japan*
09:20	▪ International collaboration and academic exchange of the CHAIN project in recent one year, *Mr. Satoru UeNo, Japan*
09:40	▪ CHAIN project: Investigations of solar active phenomenon obtained with flare monitoring telescope (FMT), *Mr. Denis CABEZAS, Peru*
10:00	▪ Within the International Collaboration CHAIN: A summary of events observed with FMT in Peru, *Mr. Jose ISHITSUKA, Peru*
10:20	▪ A 3-dimensional view of the filament eruption and coronal mass ejection associated with the 2011 March, 8 solar flare, *Ms. Maria GUTIERREZ, Peru*
10:40	▪ Solar radio spectrometer CALLISTO in Hurbanovo (Slovakia): First results, *Mr. Ivan DOROTOVIC, Slovakia*
11:00	*Coffee Break*
11:20	**Presentation Session 8: Basic Space Science Initiative Follow-up Projects**
	Chairperson: Mr. Gonzalo TANCREDI, Uruguay *Rapporteur: Mr. Darije MARCIC, Croatia*
11:20	▪ Arab astronomy and space research agency, *Mr. Hamid ALNAIMIY, United Arab Emirates*
11:40	▪ Creation of the New Ecuadorian Space Physics Division, *Mr. Ericson LOPEZ, Ecuador*
12:00	▪ Space weather monitoring centre of Egypt: Recent consequences and future prospects, *Mr. Ayman MAHROUS, Egypt*
12:20	▪ Solar System Science with Hubble Space Telescope (HST), *Ms. Susana DEUSTUA, United States of America*
12:40	▪ The Sinai Observatory, a Centre of Excellence for the region of Western Asia, *Mr. Noah BROSCH, Israel*
13:00	*Lunch Break*
14:00	**Presentation Session 8: Basic Space Science Initiative Follow-up Projects (continues)**

	Chairperson: Mr. Ayman MAHROUS, Egypt *Rapporteur: Mr. Marlos DA SILVA, Brazil*		
14:20	▪ ISWI Science Programme coordination, Mr. David WEBB, United States of America		
14:40	▪ A new South America instrumental network for the monitoring of the atmospheric electric field, Mr. Jean Pierre RAULIN, Brazil		
15:00	Questions and Answers		
16:00	*Coffee Break*		
16:20	**Discussion Session 2 (Working Groups sessions in parallel): Proposals/Recommendations**		
	Working Group 1: Basic Space Science (BSS) *Chairperson:* *Mr. Noah BROSCH, Israel*	**Working Group 2: International Heliophysical Initiative (IHY)** *Chairperson:* *Mr. Hans HAUBOLD, United Nations Office for Outer Space Affairs*	**Working Group 3: International Space Weather Initiative (ISWI)** *Chairperson:* *Mr. Joseph DAVILA, United States of America*
18:00	*Adjourn*		
Friday, 12 October 2012			
09:00	**Discussion Session 3 (Working Groups sessions in parallel): Proposals/Recommendations (continues)** ▪ *Drafting of discussion sessions reports*		
	Working Group 1: Basic Space Science (BSS)	**Working Group 2: International Heliophysical Initiative (IHY)**	**Working Group 3: International Space Weather Initiative (ISWI)**

	Chairperson: *Mr. Noah BROSCH, Israel*	*Chairperson:* *Mr. Hans HAUBOLD, United Nations Office for Outer Space Affairs*	*Chairperson:* *Mr. Joseph DAVILA, United States of America*
11:00	*Coffee Break*		
11:30	**Panel Discussion 2: Round table to finalize the recommendations, observations and proposals** *All working groups come together to finalize the recommendations* *Moderators: Ms. Sharafat GADIMOVA and Mr. Hans HAUBOLD, United Nations Office for Outer Space Affairs, Mr. Ericson LOPEZ, Ecuador*		
13:00	**Concluding Remarks** ▪ *Ms. Sharafat GADIMOVA and Mr. Hans HAUBOLD, United Nations Office for Outer Space Affairs* ▪ *Mr. Joseph DAVILA, United States of America* ▪ *Mr. Hajime HAYAKAWA, Japan* ▪ *Mr. Ericson LOPEZ, Quito Astronomical Observatory, National Polytechnic School, Ecuador*		
13:30	*Adjourn*		

SECTION 4

Resolution of the UN-Ecuador Workshop on the International Space Weather Initiative
2012 October 12, Quito, Ecuador

Space weather is important to our society, which increasingly relies on technology for education, business, transportation and communication. Storms from space can disrupt GNSS/GPS reception, and long distance radio transmission. Modern oil and gas drilling frequently involve directional drilling to tap oil and gas reservoirs deep in the Earth that depend on accurate positioning using GNSS systems. Energetic particles at the magnetic poles can force the re-routing of polar airline flights resulting in delays and increased fuel consumption. Ground induced currents generated by magnetic storms can cause extended power blackouts and increase corrosion in critical energy pipelines.

In the past space weather may have affected Earth's climate. For example, the 17th century Maunder minimum, a 70-year period almost devoid of sunspots, coincided with prolonged, very cold winters in the northern hemisphere.

Space weather is inherently an international enterprise. Solar and magnetic storms can affect large regions of the Earth simultaneously, and equatorial ionospheric disturbances occur routinely around the globe. It is, therefore, appropriate for the United Nations to promote improvement in space weather modeling and forecasting for the benefit of all nations.

Significant scientific progress has been made over the past decade in developing physics-based space weather models, and large-scale coupled (near real-time) space plasma simulations. However, these models are data starved in important spatial space-weather domains, limiting their accuracy. Guaranteed continuous space weather data streams are crucial.

The International Heliophysical Year (IHY) and International Space Weather Initiative (ISWI) have made significant progress in the installation of new instrumentation for the understanding of space weather impacts on Earth's upper atmosphere generating new data streams useful for space weather in regions unobserved before. With the support of the United Nations Office of Outer Space Affairs (OOSA) the ISWI has facilitated the operation of nearly 1000 instruments operating in about 100 of the UN member states. The data from these instrument arrays is a unique resource for the study of space weather influences on Earth's atmosphere. The IHY and ISWI schools have trained several hundred graduate students and young scientists, many of whom are becoming mature scientists as evidenced by their publications. The annual UN workshops on ISWI have facilitated instrument deployment and close international scientific collaboration. Thanks to ISWI, many scientists in developing countries are able to develop and sustain research efforts in their own countries. Finally, pursuant to the "Abuja ISWI Resolution" of the UN/Nigeria Workshop on ISWI, the International Center for Space Weather Science and Education (ICSWSE) was established in Japan on April 1st 2012.

The participants of the UN/Ecuador workshop, therefore, recommend that ISWI be continued as part of the Space Weather agenda item of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space.

Specifically

1. It is recommended that the ISWI continue the operation and development of existing arrays and deployment of new instrument arrays as appropriate.

2. It is recommended that the ISWI undertake a process to examine data sets to determine data utility, to develop connections with virtual observatories to make data more readily available, and to facilitate collaborative modeling of regions of interest (e.g. the equatorial ionosphere) in collaboration with modeling centers of the ESA, JAXA, NASA, and others.

3. It is recommended that data from ISWI instrument arrays be combined with space-based and other ground-based data to advance space weather science leading to robust research output and scientific papers in international journals. It is recommended that ISWI and GNSS communities collaborate in terms of data sharing and space weather research.

4. It is recommended that the ISWI Space Science Schools and the annual UN workshops for ISWI continue indefinitely. UN/BSS workshops and Space Science Schools are an integral part of ISWI, to train early career and new researchers in instrument operation and the science of heliophysics. The partnerships already established with international scientific organizations need to be strengthened to assure that these capacity building activities are accomplished efficiently and for the benefit of all member states.

5. It is recommended that new knowledge generated by ISWI activities be effectively communicated to the public and the scientific community at large via Newsletters, ISWI web site, and other media.

Observations and Recommendations on the future of Nobeyama Radioheliograph

UN/Ecuador Workshop on International Space Weather Initiative, October 8-12, 2012, Quito, Ecuador

The Nobeyama Radioheliograph has been observing the Sun since 1992 providing high-quality images of the Sun useful for solar physics, solar terrestrial physics, space weather events, and solar impact on Earth's climate. It is a sophisticated instrument that has been producing interferometric images of the Sun every day with very high quality for the past twenty years. All data are open for research, education and outreach purposes. A symposium is being organized to mark the 20th anniversary of the Radioheliograph in Nagoya, Japan during November 20-23, 2012. The Nobeyama Radioheliograph is unique and a valuable asset that needs to be sustained for the benefit of the world scientific community. The Nobeyama radioheliograph continues to be the unique instrument in the world and makes important contributions to the study of both short- and long-term variability of the Sun.

The participants of the UN/Ecuador workshop have noted that the National Astronomical Observatory of Japan is planning to close the Nobeyama Radioheliograph by the year 2015 due to budgetary limitations. This will

be a big loss to the international space weather community given the continuous and uniform coverage of the Sun and space weather events that the Nobeyama Radioheliograph has been providing.

Given the enormous contribution that Japan has made to the astronomy and space science communities, it is not impossible for Japan to continue the operation of the Nobeyama radioheliograph on a long-term basis. The international scientific community will be grateful if the Nobeyama radioheliograph is made to survive and the effort will be recorded as another outstanding Japanese contribution to the humankind.

Therefore, the participants of the UN/Ecuador workshop on International Space Weather Initiative strongly recommend the continued operation of the Nobeyama Radioheliograph either by the current institution or by a consortium of new institutions.

SECTION 5

FINAL LIST OF PARTICIPANTS

United Nations/Ecuador Workshop on International Space Weather Initiative (ISWI)

hosted by the Quito Astronomical Observatory of the National Polytechnic School of Ecuador

08 - 12 October 2012, Quito, Ecuador

List of Participants

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International Space Weather Initiative
Quito - Ecuador 2012

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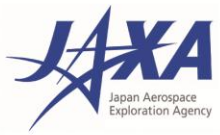
Participants

Five days of the International Space Weather Initiative

Organized and co-organized by:



Quito - Ecuador
October, 8th - 12th , 2012