United Nations/Ecuador Workshop on the International Space Weather Initiative

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ABSTRACTS

ARAB ASTRONOMY AND SPACE RESEARCH AGENCY

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Establishing an Arab Astronomy and Space Research Agency(AASRA), in which all the Arab world may participate, similar to that of the international agencies like the European Space Agency (ESA) and the US Space agency, NASA. This subject has been discussed by the Arab League and the Arab Astronomy and Space Sciences Union (AUASS). The objectives of AASRA are as follows:

1. Endeavoring to raise the profile of Astronomy and the Space Sciences to a level that that these fields may play a major role in the scientific and technological progress and development of the Arab society.

2. Studying scientific issues of common interest among Arab countries and exchanging information and experience in the various basic and applied scientific fields of Astronomy and the Space Sciences.

3. Promoting interest in Astronomy and the Space Sciences in Arab countries, supporting scientific institutions and associations in the Arab nation, and contributing to helping astronomers and Arab specialists in Astronomy and the Space Sciences to form scientific institutions and associations in Arab countries that do not yet have such authorities or associations.

4. Endeavoring to raise the level of the scientific and technical performance of specialists and those interested in the fields of Astronomy and Space Sciences in the Arab nation and providing all the necessary means available to realize these aims.

5. Contributing to building Astronomy observatories in the Arab world to serve the fields of Astronomy and the Space Sciences in the region and in the world and to provide scientific and technical consultations in these fields.

6. Contributing to educational curriculum by enriching it with vital subjects related to Astronomy and the Space Sciences.

ACHIEVEMENT DURING THE UNBSSI: IEEY, IHY AND ISWI

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In this paper are presented the achievement made during the UNBSSI, in the framework of three scientific programs:

- International Equatorial Electrojet Year [1992-1994];
- International Heliophysical Year [2005-2009];
- International Space Weather Initiative[2010-2012];

Our talk will focus on the following points:

- Deployment of GPS over Africa;
- Training of students in Africa;
- PhD defended in the framework of UNBSSI;
- Scientific Results and publications.

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

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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.

IONOSPHERIC EFFECT IN GNSS PRECISE POSITIONING APPLICATIONS

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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 GNSS techniques. 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.

The Sinai Observatory, a Centre of Excellence for the region of Western Asia

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This is an exciting period when the probability of detecting life beyond our Solar System has been greatly enhanced by the discovery of many hundreds of exo-planets, some with parameters similar to those of our Earth. Following-up these discoveries and searching them for bio-tracers of life requires access to giant telescopes, but these are few and are mostly operated by developed countries.

A group of international astronomers is promoting the development of a major observational facility in the Sinai desert where excellent observing conditions prevail. The proposed location, on the highest central peak of Sinai where the solar constant was measured a century ago, promises to be one of the best observing sites in the Northern Hemisphere.

The construction and operation of a major international facility would benefit Egypt by providing opportunities for high-level education and research in the central Sinai Peninsula. This will not only advance basic science and technology throughout Western Asia and in Egypt in particular, but will also provide access to a first-class observatory for scientists and engineers throughout the region and the world. These goals are in line with the recommendations adopted at UNISPACE III and would complement the refurbishing of the Kottamia telescope observatory reported to the UN General Assembly by COPUOS (A/AC.105/664).

The development of observational astronomy in Western Asia has been lagging behind that in the regions of Europe, Latin America and the Caribbean, and Asia and the Pacific. The African region is now taking a prominent role, with the South African efforts in optical astronomy at Sutherland and in radio astronomy with the selection of the Karoo plateau in South Africa to host the "Square Kilometer Array", the radio telescope of the future. In Latin America and the Caribbean the European Southern Observatory (ESO) operates very large telescopes and the Extremely Large Telescope design will soon start with a goal of commencing operation in a decade or so. A major astronomical facility in the Sinai would, therefore, benefit countries in the region of Western Asia and beyond.

SPACE WEATHER EFFECTS ON GLOBAL NAVIGATION SATELLITE SYSTEMS

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Traditionally, meteors were detected optically using wide-field imaging devices that were sensitive to the bright meteor population. Using triangulation methods from a number of ground stations observing simultaneously the same atmospheric volume, it was determined that most meteors produce the observed light at altitudes from 70 to 120-km. In the last decade some optical meteors were detected at even higher altitudes, up to 200-km, but the appearance of their light production seems different from that of the lower-altitude meteor population.

Here we shall describe observations of the high-altitude meteor population using a high-power, large-aperture radar located near Trømsø, Norway. We found that the optical population of meteors corresponds to a similar population of high-altitude radar meteors. These seem to be very fragile and are observed even near 300-km altitude. We discriminate between radar echoes produced by meteoroids and echoes from orbital debris, also visible in our observations.

Our observations indicate the presence of a significant population of meteoroids that could, in principle, produce an added hazard for satellites. We bring this to the attention of the community with a proposal to investigate the physical properties of this meteoroid population in order to evaluate the risk it poses to orbital assets.

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

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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 FMT[1] relocated from Hida Observatory of Kyoto University to Ica National University in Peru under the international collaboration of the CHAIN[2]-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 H-alpha, while we identify oscillations/activations of Hα filaments (winking filaments) at distance locations of flare site. In the extreme ultraviolet data taken by the AIA[3] on board SDO[4] and EUVI[5] on board the STEREO[6]-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.

[1]Flare Monitoring Telescope,[2] Continuous H-alpha Imaging Network, [3]Atmospheric Imaging Assembly, [4]Solar Dynamic Observatory, [5]Extreme-Ultraviolet Imager, [6]Solar Terrestrial Relations Observatory

MAGDAS I AND II MAGNETOMETERS IN PERU

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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').

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

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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.

THE ISWI WEBSITE AND THE ISWI NEWSLETTER: A SUMMARY REPORT

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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 SYSTEM SCIENCE WITH HST

S. Deustua

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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.

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

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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.

UNITED NATIONS BASIC SPACE SCIENCE INITIATIVE (UNBSSI), 1991- 2012

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The United Nations Basic Space Science Initiative (UNBSSI) is a long-term effort for the development of astronomy and space science through regional and international cooperation in this field on a worldwide basis, particularly in developing nations. UNBSSI workshops are co-sponsored and co-organized by the European Space Agency (ESA), the Japan Aerospace Exploration Agency (JAXA), and the National Aeronautics and Space Administration (NASA).

A series of workshops on Basic Space Science (BSS) was held from 1991 to 2004 (India 1991, Costa Rica and Colombia 1992, Nigeria 1993, Egypt 1994, Sri Lanka 1995, Germany 1996, Honduras 1997, Jordan 1999, France 2000, Mauritius 2001, Argentina 2002, and China 2004; http://neutrino.aquaphoenix.com/un-esa/) and addressed the status of astronomy in Asia and the Pacific, Latin America and the Caribbean, Africa, and Western Asia. Through the lead of Professor Dr. Masatoshi Kitamura (1926-2012) from the National Astronomical Observatory Japan (NAOJ), astronomical telescope facilities were inaugurated in seven developing nations and planetariums were established in twenty developing nations based on the donation of respective equipment by Japan.

Pursuant to resolutions of the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) and its Scientific and Technical Subcommittee, since 2005, these workshops focused on the preparations for and the follow-ups to the International Heliophysical Year 2007 (UAE 2005, India 2006, Japan 2007, Bulgaria 2008, South Korea 2009; http://www.unoosa.org/oosa/SAP/bss/ihy2007/index.html). IHY's legacy is the current operation of 16 worldwide instrument arrays with close to 1000 instruments recording data on solar-terrestrial interaction from coronal mass ejections to variations of the total electron content in the ionosphere (http://iswi-secretariat.org/). Instruments are provided to hosting institutions by entities of Armenia, Brazil, France, Israel, Japan, Switzerland, and the United States.

Starting in 2010, the workshops focused on the International Space Weather Initiative (ISWI) as mandated in a three-year-work plan as part of the deliberations of UNCOPUOS. Workshops on ISWI were scheduled for Egypt in 2010 for Western Asia, Nigeria in 2011 for Africa, and Ecuador in 2012 for Latin America and the Caribbean. The latter one will be held from 8-12 October 2012 at the Astronomical Observatory of Quito (http://oaq.epn.edu.ec/iswi/index.html). This workshop will review the results of the operation of the above instrument arrays and will discuss ways and means to continue space weather research and education, particularly focusing on programmes as implemented by the International Center for Space Weather Science and Education at Kyushu University, Fukuoka, Japan (http://www.serc.kyushu-u.ac.jp/index_e.html), which was established through the UNBSSI in 2012. Similar research and education centers were also established in Nigeria (http://www.cbssonline.com/aboutus.html) and in India (http://www.cmsintl.org/).

Activities of UNBSSI are also coordinated with the Regional Centres for Space Science and Technology Education, affiliated to the United Nations and the International Committee on Global Navigation Satellite Systems (ICG) (http://www.unoosa.org/oosa/en/SAP/gnss/icg.html). The Regional Centres for Africa are located in Morocco and Nigeria; for Asia and the Pacific in India; and for Latin America and the Caribbean in Brazil and Mexico (http://www.unoosa.org/oosa/en/SAP/centres/index.html).

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

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We present a detailed 3-dimensional features of the filament ejection and coronal mass ejections associated with the M4.4 flare that occurred on 2011 March 8 flare at the active region NOAA 11165. The Ha full disk images of the flare and filament ejection were successfully obtained by the Flare Monitoring Telescope (FMT) relocated from Hida Observatory of Kyoto University to Ica University in Peru under the international collaboration of the CHAIN (Continuous H Alpha Imaging Network) – project. The observation in multi wavelengths around the Ha line enabled us to derive the 3-dimensional velocity field of the Ha filament ejection. The features in extreme ultraviolet were also obtained by the Atmospheric Imager Assembly (AIA) on board the Solar Dynamic Observatory (SDO) and the Extreme Ultraviolet Imager (EUVI) of the Sun Earth Connection Corona and Heliospheric Investigation (SECCHI) on board the Solar Terrestrial Relations Observatory (STEREO) - A head satellite.

In this presentation we report in the detail the evolution of the ejection followed by a coronal mass ejection. We also discuss the evolution of the active region in the context of the coronal magnetic field of the flare region.

SOLAR RADIO BURSTS AND SPACE WEATHER

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Radio bursts from the Sun are produced by electron accelerated to relativistic energies by physical processes on the Sun such as solar flares and coronal mass ejections (CMEs). The radio bursts are thus good indicators of solar eruptions. Three types of nonthermal radio bursts are generally associated with CMEs. Type III bursts due to accelerated electrons propagating along open magnetic field lines. The electrons are thought to be accelerated at the reconnection region beneath the erupting CME, although there is another view that the electrons may be accelerated at the CME-driven shock. Type II bursts are due to electrons accelerated at the shock front. Type II bursts are also excellent indicators of solar energetic particle (SEP) events because the same shock is supposed accelerate electrons and ions. There is a hierarchical relationship between the wavelength range of type II bursts and the CME kinetic energy. Finally, Type IV bursts are due to electrons trapped in moving or stationary structures. The low-frequency stationary type IV bursts are observed occasionally in association with very fast CMEs. These bursts originate from flare loops behind the erupting CME and hence indicate tall loops. This paper presents a summary of radio bursts and their relation to CMEs and how they can be useful for space weather predictions.

ISWI AND AWESOME PROJECT IN VIETNAM

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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.

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

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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 this presentation.

SPACE WEATHER RESEARCH IN KAZAKHSTAN

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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).

MULTIPHYSICS MODELLING OF SPACE WEATHER

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The need to handle the coupling between microscopic and macroscopic processes in plasma physics is ubiquitous. The wide difference in mass between electrons and ions and the great change in time and space scales between large-scale magnetohydrodynamic processes and small-scale kinetic effects pose a great challenge to the simulation of plasma physics problems. The traditional approach has been to try to derive reduced models of the full first principle physics model and solve them considering only the scales of interest. We present a different point of view, based on using first principle methods for each scale, relying on coupling different physics approaches for each scale, fluid for the macroscopic and kinetic for the microscopic. The implicit moment model relies on numerical methods that can effectively average the smallest scales within correct kinetic treatment while focusing on large-scale structures. The application of this approach will be presented in light of the new EC funded project SWIFF (swiff. eu) to study new methods for micromacro coupling in space physics. Swiff encompasses 7 Centers in 5 European Countries and is coordinated by Giovanni Lapenta**.**

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

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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 were found in the data in the period of time from January, 2010 to March, 2010 and the possible relation between them.
Key words: VLF, soft X-ray, FUV, SAVNET.

UPDATE ON MAGDAS ACTIVITIES SINCE THE LAST ISWI WORKSHOP

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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.

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

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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.

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

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We analyze the kinematics of the three multiple interplanetary coronal mass ejections (ICMEs) events incurred 22nd January 2012, 15th February 2012 and 6 th March 2012. ICMEs of analyzed multiple events arriving at the Earth distance as a single magnetic structure and caused solar wind (SW) disturbances and Furbish decrease (FD). This successive ICME events present us opportunity to study colliding of ICMEs with unprecedented heliosperic imaging and observations from multiple vantage points. Furthermore, enable us to investigate the timing of the FD relative to solar wind disturbances and the ICMEs arrival times at the Earth distance.

The analysis is based on the images obtained from the Extreme Ultraviolet Imager (EUVI), as well as COR1, COR2 and HI-1 coronagraphs on board the twin STEREO spacecraft's. Moreover, we obtain the direction and full de-projected kinematic for ICMEs by applying Geometric Triangulation (GT) and Harmonic Mean (HM) methods. Solar wind disturbances data was taken from WIND satellite and cosmic rays (CRs) intensity data was taken from Moscow neutron monitor and Space Environmental Viewing and Analysis Network (SEVAN) particles detectors. Information about flares activity during emergence of the ICMEs was taken from Solar Dynamic Observatory (SDO) satellite.

The analysis revealed that estimated arrival times of the ICMEs at the L1 point (where is WIND satellite) and the Earth distance (where is SEVAN cosmic ray detector), obtained from STEREO-A & B data are in good coincidence with the observed onset of the SW disturbances and Furbish decrease. We speculate that from linear fit of ICME propagation distance of SECCHI HI1 data in post acceleration phase (from 10 and below 70 R), we can calculate the arrival time of the ICMEs at Earth distance with precision of the ± 3 h.

Key words: Interplanetary coronal mass ejection, Cosmic Rays and Solar wind disturbances

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

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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.

A PATHWAY IDEA FOR MODEL BUILDING

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Models, mathematical or stochastic, which move from one functional form to another through pathway parameters, so that in between stages can be captured, are examined in this article. Models which move from generalized type-1 beta family to type-2 beta family, to generalized gamma family to generalized Mittag-Leffler family to Levy distributions are examined here. It is known that one can likely find an approximate model for the data at hand whether the data are coming from biological, physical, engineering, social sciences or other areas. Different families of functions are connected through the pathway parameters and hence one will find a suitable member from within one of the families or in between stages of two families. Graphs are provided to show the movement of the different models showing thicker tails, thinner tails, right tail cut off etc.

Keywords: Generalized gamma, Mittag-Leffler distributions.

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

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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.

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

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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.

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

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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.

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

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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 inter-relationships 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.

Key words: Space weather, Sq, geomagnetic field, ionosphere, TEC

THE SOUTH AMERICA VLF NETWORK - SAVNET: ACHIEVEMENTS, LATEST RESULTS AND FUTURE DIRECTIONS

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In this paper we present recent results obtained by the South America VLF Network (SAVNET). The use of the VLF technique by tracking subionospheric propagation anomalies appears as a very promising tool to study various aspects of Space Weather disturbances. On long timescales it is possible to indirectly monitor the solar Lyman-α radiation along the solar cycles. Short time phenomena like solar explosive events can be observed with 100% probability, even for the small intensity events. The effect of high-energy precipitating solar particles can be tracked in the low ionosphere. The same technique is also relevant to study the ionospheric perturbations caused by geomagnetic storms on typical timescales of a day to few days. Extra solar and terrestrial high-energy phenomena are naturally detected in the very sensitive low ionospheric plasma, as Gamma-ray bursts and Soft Gamma-ray repeaters. Finally, the remote sensing of the low ionosphere is also used to search for seismic-electromagnetic effects prior to Earthquakes**.**

At the present time, SAVNET is composed of nine (9) tracking receiver stations in Brazil, Peru, Argentina and Mexico. In this presentation we will describe our future plans for expanding the array. Eastern Europe, Ecuador and Asia are good host candidates to participate in these forthcoming activities. The array expansion is necessary to improve the probability detection of very high-energy remote phenomena, and to demonstrate that these processes of great astrophysical importance can be easily detected using a cheap and simple technique**.**

HIGHLIGHTS OF THE 2012 WORKSHOP ON SOCIETAL IMPACTS OF SPACE WEATHER

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Space weather can have adverse impacts on the space technology upon which society is increasingly dependent. A "Workshop on the Societal Impacts of Space Weather" was held on 8 June 2012during the fifty-fifth meeting of U.N. Committee on the Peaceful Uses of Outer Space (COPUOS) in Vienna. Organized by the United States, the workshop focused attention on space weather effects on society, with special attention to the needs of developing nations. In this presentation, we report on the main results of the workshop.

MONITORING THE GEOMAGNETIC FIELD UNDER THE SOUTH ATLANTIC MAGNETIC ANOMALY

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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.

SOLAR ENERGETIC PARTICLES: ORIGIN AND SPACE WEATHER RELEVANCE

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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 X-ray 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.

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

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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.

ISWI SCIENCE PROGRAM COORDINATION

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We report on the status of the coordination of the science program for ISWI being established along the lines of the International Heliophysics Year (IHY) Coordinated Investigation Programmes (CIPs). The overall goal of the ISWI program is to gain a more complete understanding of the universal processes that govern the Sun, Earth, planets and heliosphere. It will involve scientists from a variety of disciplines: Solar Physics, Planetary Magnetospheres, Heliosphere and Cosmic Rays, Planetary Ionospheres, Thermospheres and Mesospheres, and Climate Studies. The analysis and discussion of the ISWI science projects focuses on the fundamental underlying physics of each phenomenon, and will facilitate discussion between the different disciplines by focusing on the relationships between these phenomena and the commonalities in the physical processes. This allows researchers to plan and participate in cross-disciplinary studies, culminating in a greater understanding of fundamental universal processes. The primary data sets are expected to come from ISWI (IHY Legacy) Observatory Instruments. A communication interface will be set up through a separate internet site or via a link to the main ISWI web site. Specific details will be made available later through the ISWI Newsletter. The ISWI Science Program was first announced by Hans Haubold at the 2011 UN-ISWI Workshop in Nigeria.

ESTABLISHMENT OF INTERNATIONAL CENTER FOR SPACE WEATHER SCIENCE AND EDUCATION

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Some of the milestones of SERC ("Space Environment Research Center" -- operated from 2002 to 2012) are covered in this presentation. However, at the request of the participants of "UN/Nigeria Workshop on ISWI", it was decided that this center should focus on space weather science and education.

Accordingly, at the start of April 2012, the name of this center (which is based at Kyushu University in Fukuoka, Japan) was changed to "International Center for Space Weather Science and Education". The agenda of this new center will be discussed.