2014 AOGS Meeting in Sapporo, Japan.

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28 July – 01 August, 2014.

In-situ Photos of Presenters of ST04-06

Session

ST04-06 Solar Activity, Space Weather and Space Climate

01 August, 2014, 11:00 AM to 12:30 PM.

Regent Hall, Royton Hotel Sapporo, Japan.

Main Convener

Prof. Katya Georgieva

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Session Chair

Mr. George Maeda

International Center for Space Weather Science and Education

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Left: Talk by Dr Leif Svalgaard (Stanford University, USA)

Regent Hall, Royton Hotel, Sapporo.

Right: Talk by Dr Yong-Jae Moon (Kyung Hee University, Korea)

Session notes (by the Session Chair) :

- There were six talks scheduled.
- The speaker for each talk showed up.
- The Session Chair (G. Maeda) took a photo of each speaker during talk delivery.
- Each was talk was given 15 minutes of presentation time (including time for questions).
- The session took place without a hitch.

1.

ST04-06-D5-AM2-RH-004 (ST04-06-A039)

Reconstruction of the Heliospheric Magnetic Field Strength 1835-2014

Leif SVALGAARD # +
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After C. F. Gauss and W. E. Weber's invention of the Magnetometer in 1833 systematic [e.g. hourly] measurements of the variation of the Earth's magnetic field were begun at several newly erected observatories around the World ["the Magneic Crusade"]. These observations [greatly expanded] continue to this day. Magnetometers on the first spacecrafts to explore interplanetary space in 1962 showed that the, long hypothesized and then detected, solar wind carried a measurable magnetic field, which was soon identified as the main driver of disturbances of the magnetic fields observed at the Earth. Vigorous research during the last decade has shown that it is possible to 'invert' the causative effect of the magnetic field in near-Earth interplanetary space [the near-Earth Heliospheric Magnetic Field] and to infer with good accuracy the value of that field [and also of the solar wind speed and density] from the observed magnetic changes measured at the surface of the Earth. In this talk we describe the remarkable consensus reached by several researchers of the variation of the Heliospheric Magnetic Field (and thus of its source: the solar magnetic field) since the 1830s to today. We place the 23-24 minimum in context of the long-term variation.

2.

ST04-06-D5-AM2-RH-005 (ST04-06-A023)

400 Years of Space Climate Information from Long-term Main Geomagnetic Field Models

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Space climate refers to long-term changes in the Sun and its effects in the heliosphere and upon the Earth, being the background on which space weather evolves (acts). The solar-terrestrial science has long benefited, especially before the space era, from the study of geomagnetic phenomena known as geomagnetic activity. Except solar activity proper, monitored since the 17th century, information on heliosphere behaviour in terms of solar wind and heliospheric (interplanetary) magnetic field variability could be retrieved mostly from geomagnetic observatory data via geomagnetic field variability expressed as time series of geomagnetic indices. The information is, however, limited to the last 150 years, the life-time span of geomagnetic observatories. We expand the information on geoeffective solar/heliospheric activity back to 1600, valuing two main geomagnetic field models, namely gufm1 (Jackson et al., 2000) and COV-OBS (Gillet et al., 2013). The former (1590-1990) is based on geomagnetic observatory data and prior geomagnetic measurements taken during sea voyages, while the latter (1840-2010) is based on geomagnetic observatory data and satellite geomagnetic measurements. Characteristics of the retrieved information, at time scales of the 11-year solar cycle and of the Hale magnetic solar cycle, are discussed, including activity during solar grand minima.

3.

ST04-06-D5-AM2-RH-006 (ST04-06-A033)

Improving Space Weather Forecasting Through the Observation of the Coronal Magnetic Field

Michael THOMPSON # + , Steven TOMCZYK, Joseph PLOWMAN
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The Coronal Multichannel Polarimeter (CoMP) instrument, operated by HAO at the Mauna Loa Solar

Observatory, is the only existing observational asset that obtains routine measurements of the coronal magnetic field. The CoMP instrument is moreover the prototype for the proposed Coronal Solar Magnetism Observatory (COSMO) large coronagraph. CoMP and, in the future, COSMO thus provide unique data for incorporating into space weather forecasting. I shall discuss the potential for CoMP and COSMO magnetic field measurements to improve observational models of the 3D magnetic field of the corona and to better forecast the expect magnetic configuration within CMEs, a property that is crucial for establishing their geoeffectiveness.

4.

ST04-06-D5-AM2-RH-007 (ST04-06-A030)

How the PROBA2 Satellite is Helping us Better Understand Solar Activity and Space Weather

Thanassis KATSIYANNIS 1, 2 # +

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PROBA2 is an ESA technology demonstration micro-satellite launched in 2009. Its science payload consists of two major instruments (SWAP & LYRA) which observe the solar corona and two in-situ (DSLP & TPMU) which measure the space environment around the satellite.

SWAP is an EUV imager which observes the solar corona at a temperature of ~1 MK with a high cadence (~1 image per min), a field-of-view of 54 arcmin and a number of cutting-edge space technologies (namely an APS detector, advanced data compressing techniques, on-board data prioritisation algorithms, etc). LYRA is a UV irradiance radiometer that observes the Sun in four passbands at an extremely high cadence of up to 100 Hz. It is consisted of three redundant units, each having a full suit of the four passband detectors. As with SWAP, LYRA also features a number of advanced technologies as it is the first space instrument utilising bandgap detectors based on diamonds.

A number of very meaningful scientific advances obtained by PROBA2's main instruments will be presented during this talk. The study of solar eruptions (such as Lyman-alpha flares and coronal mass ejections), and the observation of the results of magnetic reconnection events are some typical examples of the very substantial contribution that the aforementioned instruments have made. Their relevance and their implications to solar physics and space weather will also be extensively discussed.

5.

ST04-06-D5-AM2-RH-008 (ST04-06-A008)

Relation of Solar Wind Types with Solar Activity and Their Role in Transfer of Disturbances from the Sun to the Earth

Yuri YERMOLAEV # + , Nadezhda NIKOLAEVA, Irina LODKINA

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We classified various large-scale types of solar wind streams (HCS, CIR, Sheath, MC and Ejecta) for period 1976-2000 on the basis of OMNI dataset of interplanetary plasma and magnetic field measurements (see for details 鼎 atalog of large scale phenomena during 1976-2000・published by Yermolaev et al, Cosmic Research, 2009, Vol. 47, No. 2, pp. 81-94 and presented on websites: ftp://ftp.iki.rssi.ru/pub/omni/ ftp://ftp.iki.rssi.ru/pub/omni/catalog/). We discuss the connection of these interplanetary events with solar corona phenomena and their role in transfer of disturbances from the Sun to the Earth and generation of magnetosphere activity. The main result of our investigation is the dependence of magnetosphere reaction on type of interplanetary drivers (see details on site http://www.iki.rssi.ru/people/yyermol_inf.html). This work was supported by the RFBR, project 13-02-00158a, and by the Program 22 of Presidium of Russian Academy of Sciences.

6.

ST04-06-D5-AM2-RH-009 (ST04-06-A021)

Development of a Geomagnetic Storm Model to Forecast Its Start Time, Probability, and Strength Using CME Parameters

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Current techniques to forecast a geomagnetic storm mostly use solar wind in-situ measurements that provide only a short lead time, which is not sufficient to prevent from space weather disasters. One of the challenging issues is to forecast a geomagnetic storm with a longer lead-time. In this study, we are developing a geomagnetic storm model to forecast its start time, probability, and strength using CME parameters with a lead time of 1-3 days. For this we are going to answer the following three questions: (1) when does a CME arrive at the Earth? (2) what is the probability that a CME can induce a geomagnetic storm? and (3) how strong is the storm? To address the first question, we forecast the arrival time and other physical parameters of CMEs at the Earth using the WSA-ENLIL model with three CME cone types. The second question is answered by examining the geoeffective and non-geoeffective CMEs depending on CME observations (speed, source location, earthward direction, magnetic field orientation, and cone-model output). The third question is addressed by examining the relationship between CME parameters and geomagnetic indices (or IMF southward component). The forecast method will be developed with a three-stage approach, which will make a prediction within four hours after the solar coronagraph data become available. We expect that this study will enable us to forecast the onset and strength of a geomagnetic storm a few days in advance using only CME parameters and the physics-based models.

End of In-situ Photos of Presenters of ST04-06

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