Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

PEM10-01 Room:102A Time:May 25 09:00-09:15

Current status and future plans of CAWSES-II

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ICSU-SCOSTEP which promoted the STEP program (1990-1997) and the S-RAMP program (STEP-Results, Applications and Modeling Phase, 1998-2002) carried out the first international collaborative research project on CAWSES (Climate And Weather of the Sun-Earth System, 2004-2008) which examined space weather and space climate of sun-earth system in the twenty-first century. ICSU-SCOSTEP successively established an international program of the CAWSES-II (2009-2013) with an aim of significantly enhancing our understanding of the space environment and its impacts on life and society. The main functions of CAWSES-II are to help coordinate international activities in observations, modeling, and applications crucial to achieving this understanding, to involve scientists in both developed and developing countries, and to provide educational opportunities for students of all levels.

CAWSES-II is organized by the following four Task Groups and other two Fundamental Groups.

TG1. What are the solar influences on climate?
TG2. How will geospace respond to an altered climate?
TG3. How does short-term solar variability affect the geospace environment?
TG4. What is the geospace response to variable inputs from the lower atmosphere?
G5. Capacity building
G6. Escience and informatics (Virtual Institute)

Japanese SCOSTEP Committee decided the domestic leaders and members each of the 6 groups, many ground-based and satellite observations and modeling/simulation projects are energetically going on to study the proposed questions. We review the current status of many observational and modeling/simulation projects and discuss next plans for collaboration among research groups. International CAWSES-II Symposium is planed to be held in 2013, in Nagoya Japan to summarize CAWSES-II achievements and to discuss future directions. We will discuss more concrete plan of the symposium.

Keywords: CAWSES-II, space weather, space climate, current status, future plan, SCOSTEP

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PEM10-02 Room:102A Time:May 25 09:15-09:30

Formation of Preliminary Center for Capacity Building for Space Weather Research

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We (Space Environment Research Center of Kyushu University) report on a new International Core-to-Core program that we are promoting.

Consistent with the goals of the International Space Weather Initiative (ISWI, which is conducted under a mandate of the United Nations Committee on the Peaceful Uses of Outer Space), the ultimate goal of our new Core-to-Core research program is to (1) strengthen the space-weather-related research abilities of young scientists in the Asia region and Africa region, and (2) expose young Japanese scientists to more internationally-oriented science activities, such as doing field work in Asia and Africa.

The primary agenda, therefore, is to conduct Capacity Building for young scientists in Japan and Asia/Africa regions through a wide-variety of approaches: (1) conducting overseas ISWI/MAGDAS Schools, (2) implementing student exchanges, (3) installing ground magnetometers (e.g., MAGDAS - Magnetic Data Acquisition System) in "missing areas", and (4) bringing Asians and Africans to study at Japanese universities. Through this myriad of approaches, a human network for space weather research is established.

The term "Capacity Building" (as used here) means training the young scientists (in Asia/Africa) who take care of MAGDAS magnetometers so that there is mutual benefit between instrument providers and instrument hosts. This training has three main components: (1) training on the instrumentation (maintenance and installation), (2) training on data analysis (how to process the data from the instrumentation), and (3) instruction on how to do science with the acquired data – with an emphasis on doing science particular to the region of the instrument site.

The ISWI/MAGDAS Schools are especially effective for conducting Capacity Building, and helps not only the host students and scientists but also improves the skills of the Japanese researchers who are dispatched as school instructors. Interaction with various hosts allows their most talented people to consider further study at Kyushu University at the graduate school level, thereby expanding the aforementioned human network.

Our Core-to-Core research program also focuses on the enhancement of partnership between MAGDAS hosts. We envision the establishment of long-term partnership between the Japanese coordinator and host countries by setting up an association of MAGDAS hosts.

Keywords: International Space Weather Initiative, new Core-to-Core research program, Capacity Building, MAGDAS - Magnetic Data Acquisition System, ISWI/MAGDAS Schools

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PEM10-03 Room:102A Time:May 25 09:30-09:45

Current status of the CAWSES-II Task Group 4: What is the geospace response to variable inputs from the lower atmosphere

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Recent developments of coupled modeling between neutral and ionized atmosphere and various observation techniques such as advanced radars, airglow imaging, and GPS networks, make it possible to study geospace response to variable inputs from the lower atmosphere. Consequences for telecommunications, re-entry and satellite operations still need to be explored. The extent to which the effects of this quiescent atmospheric variability are transmitted to the magnetosphere is yet to be resolved. We thus stand right now at an exciting research frontier: understanding the cause-and-effect chain that connects tropospherican strato-/mesospheric variability with geospace processes. CAWSES-II Task Group 4 (TG4) will therefore elucidate the dynamical coupling from the low and middle atmosphere to the geospace including the upper atmosphere, ionosphere, and magnetosphere, for various frequencies and scales, such as gravity waves, tides, and planetary waves, and for equatorial, middle, and high latitudes. Attacking the problem clearly requires asystems approach involving experimentalists, data analysts and modelers from different communities. For that purpose, the most essential part of TG4 is to encourage interactions between atmospheric scientists and plasma scientists on all occasions. TG4 newsletters are distributed to the related scientists every 3-4 months to introduce various activities of atmospheric and ionospheric researches. Five projects are established in TG4, i.e., Project 1: How do atmospheric waves connect tropospheric weather with ITM variability?, Project 2: What is the relation between atmospheric waves and ionospheric instabilities?, Project 3: How do the different types of waves interact as they propagate through the stratosphere to the ionosphere?, Project 4: How do thermospheric disturbances generated by auroral processes interact with the neutral and ionized atmosphere?, and Project 5: How do thunderstorm activities interact with the atmosphere, ionosphere and magnetosphere? Three campaign observations have been carried out in relation to the TG4 activity, i.e, stratospheric sudden warming campaign (January-February, 2010), longitudinal campaign (September 1-November 12, 2010 and August 22-November 2, 2011), and CAWSES Tidal Campaign. In this presentation we show the current status and future plan of CAWSES-II TG4 activities of 2009-2013.

Keywords: CAWSES-II, Task Gruop 4, ionosphere, thermosphere, middle atmosphere, atmospheric waves

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PEM10-04 Room:102A Time:May 25 09:45-10:00

Introduction of Recent CAWSES-II / Capacity-Building Activities of Japan

UENO, Satoru[1*], YUMOTO, Kiyohumi[2], MAKITA, Kazuo[3], MUNAKATA, Kazuoki[4], MIZUNO, Akira[5], TSUDA, Toshitaka[6]

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NOTE: UeNo will attend the meeting from 22nd May.
So, please set the time of this talk after the morning of 22nd.

In this talk, we introduce outlines of recent capacity-building activities of Japanese observation-network projects that have been led by Japanese domestic committee and members of CAWSES-II Capacity-building group.

Yumoto et al. have promoted MAGDAS project whose aim is studies of dynamics of geospace plasma that changes during magnetic storms and auroral substorms, the electromagnetic response of ionomagnetosphere to various solar wind changes, and the penetration and propagation mechanism of DP2-ULF range disturbances.
Under this project, they have performed installations of instruments all over the world, scientific and technical educations to people at each observation-site and holding international scientific workshops.

UeNo et al. have promoted CHAIN project whose purpose is to form international ground-based solar observation network in order to monitor all large-scale solar explosive phenomena on the full-disk solar chromosphere that may have large influence to geospace, and to measure physical parameters of those phenomena.
Under this project, they also have performed scientific and technical educations to people at the observation-site and holding international scientific workshops.

Makita et al. are promoting SARINET project whose objective is the examine the environment of the upper atmosphere in the Geomagnetic Hole (GH) around South America by using imaging Riometers (IRIS) and 1ch Riometers. They have performed cooperative research with Brazilian students of Santa Maria University and technical meetings with related universities.

Munakata et al. are promoting GMDN project in order to identify the precursory decrease of cosmic ray intensity that takes place more than one day prior to the Earth-arrival of shock driven by an interplanetary coronal mass ejection, through the cooperation with USA, Australia, Brazil, Kuwait, Armenia, Germany and Mexico.

Mizuno et al. are promoting NDACC project that aim to investigate composition's change of middle atmosphere and elucidation of the mechanism by expanding lidar-observation network mainly in Argentina.

Tsuda et al. are promoting "Ground-based Atmosphere Observation Network in Equatorial Asia" in which they are doing internationally collaborated researches on the behavior of the equatorial atmosphere and ionosphere in tropical Asia by using ground-based and satellite observations, so that the scientific North-South problem will be improved.

Keywords: CAWSES-II, SCOSTEP, Capacity Building

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PEM10-05 Room:102A Time:May 25 10:00-10:15

Estimation of solar ultraviolet radiation and the effect on the upper atmosphere based on solar images

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[1]Kyoto University, [2]Wakayama University, [3]RIKEN, [4]Nagoya University

We report on the estimation of long-term variations of solar UV/EUV emissions, which affect on the upper thermosphere, by using full-disk solar images. The SOHO/EIT has shown us full-disk features of the sun in EUVs over 15 years. These data enable us to derive the, spatially resolved, long-term variation of area, brightness of coronal holes, active regions, and so on. On the other hand, ground-based chromospheric observations also give us another indicator of solar UV emission, since solar UV radiation mainly comes from the chromosphere. From these data, we try to derive the main features on the solar surface that affect on the upper thermosphere and to estimate the long-term UV/EUV variations.

Keywords: Solar Activity, Solar UV Radiation, Solar Chromosphere, Sq Variation

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PEM10-06 Room:102A Time:May 25 10:15-10:30

Precise measurements of magnetic fields in the solar chromosphere for coronal field modeling

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It is critically important to understand mechanisms of accumulation and release of magnetic energies in solar coronae responsible for a solar flare and its impact to the space weather. A strong tool to study it is magnetic field extrapolation based on nonlinear force-free modeling. For reliable modeling of coronal magnetic fields, it's essential to employ boundary condition based on measurements of magnetic field vectors on the solar surface provided with spectro-polarimetric observations. Photospheric magnetic fields are now routinely available with ground-based and space-based observatories such as SOLIS, Hinode, and SDO. But plasma beta in the solar photosphere is larger than unity, which does not guarantee the force-free condition and makes it difficult to get reliable extrapolation using the photospheric magnetic fields as the boundary condition. One possible approach to resolve the issue is to use magnetic field information in the chromosphere where plasma beta is comparable with or smaller than unity. But the chromospheric fields are generally weaker than the photospheric ones, and it is still hard to obtain reliable magnetic field vectors in the solar chromosphere.

We performed a campaign observation to get thermo-dynamical and magnetic field properties in the solar chromosphere using Facility Infrared Spectropolarimeter (FIRS) and Interferometric BIdimensional Spectrometer (IBIS) at the Dunn Solar Telescope (DST) of the National Solar Observatory in United States. Hinode Solar Optical Telescope (SOT) also joined in this campaign, and provided precise magnetic field data in the photosphere. The primary objective of this campaign is to identify super-sonic flows in the chromosphere around a sunspot, and to investigate how the flow velocities are related with magnetic field configuration and plasma condition. We observed a well-developed sunspot in an active region 11330 from 25 Oct to 31 Oct in 2012. We successfully obtained good spectro-polarimetric data for diagnostics of chromospheric fields simultaneous with high cadence filtergram data for studying chromospheric dynamics. We are now trying to retrieve magnetic field vectors from the polarimetric data using the Zeeman and the Hanle effect. We are going to report our progress of the data analysis in the campaign observation.

Keywords: the Sun, chromospheric magnetic field, polarization measurement, coronal magnetic field

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PEM10-07 Room:102A Time:May 25 10:45-11:00

High speed imaging systems at Hida observatory for the research of high energy particles in solar flares

ICHIMOTO, Kiyoshi[1*], Takako, T. Ishii[1], Tomoko Kawate[1], Yoshikazu Nakatani[1], Shin'Ichi Nagata[1], Yusuke Yoshinaga[1], Satoshi Morita[1], Ayumi Asai[1], Satoshi Masuda[2], Kanya Kusano[2], Tetsuya Yamamoto[2], Takashi Minoshima[3], Kyoko Watanabe[4], Takaaki Yokoyama[5]

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A new imaging system for observing solar flares was installed on the Solar Magnetic Activity Research Telescope (SMART) at the Hida observatory of Kyoto University with a support of the joint research program of the Solar-Terrestorial Environment Laboratory of Nagoya University. The aim of the system is to diagnose the non-thermal particles, their acceleration site and the trigger of solar flares by capturing rapid temporal and spatial evolution of flare kernels observed in the solar chromosphere and photosphere at the onset of flares. The system simultaneously takes H? and continuum images covering a field of view of 344 arcsec x 258 arcsec at a rate of 25 frames/sec. The first-light images were taken in August 2011 and two white light flares were successfully observed on 6 and 7 September. We report the performance of the new observing system, its initial results and our plan for conducting the research on particle acceleration and the trigger mechanism of solar flares.

Keywords: sun, flare, particle acceleration, imaging observation

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PEM10-08 Room:102A Time:May 25 11:00-11:15

Observation Condition of Geomagnetic Anomaly Phenomena in South America

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In order to examine upper atmosphere phenomena in South Atlantic Anomaly, we installed several instruments(Imaging riometer,CCD camera, Magnetometer, Electric Field detector and etc.) at Southern Space Observatory(SSO), Brazil and surrounding area.We concentrated imaging riometer(IRIS) observation recently.At present, 6 IRIS's are installed from the equator to the southern end of South America.It is essential to determine the cosmic noise intensity curve during quiet period(quiet day curve: QDC).We are carefully examine original IRIS data and want to advance data analysis.

On the other hands, we are interested in atmospheric electric field. Although events are few, we found that variation of atmospheric electric field at SSO is related with magnetic field disturbance in polar region. If this phenomena are really occurred,we consider that global electric field in magnetosphere penetrates into SSO region and/or ionospheric electric field may change due to the particle precipitation in SSO.We are now preparing for electric detectors and hope to install these detectors at several places around geiomagnetic anomaly area.

Keywords: geomagnetic anomaly, Imaging riometer, Atmospheric Electric Field

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PEM10-09 Room:102A Time:May 25 11:15-11:30

Asia VLF Observation Network (AVON) system for monitoring the D- and lower E-region ionosphere

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We introduce Asia VLF Observation Network (AVON) system. The observation targets of the AVON are the D- and lower E-region ionosphere, lightning activities, and ionospheric disturbances associated with lightning in Southeast Asia. In this study, we show the results of the D- and lower E-region ionosphere. The observation system is installed at three sites: Tainan site (23.08N, 120.12E) in Taiwan, Saraburi site (14.53N, 101.03E) in Thailand, and Pontianak site (0.00N, 109.37E) in Indonesia. In addition, we have a plan to install the observation system at Laoag in Philippine and Hanoi in Vietnam in 2012. At each site, we use a dipole antenna for the electric field measurements and an orthogonal loop antenna for the magnetic field measurements. At Tainan, Saraburi, and Pontianak sites, LF transmitter signals are observed with a monopole antenna. With a set of orthogonal loop and dipole antennas, tweek atmospherics (0.1 - 10.0 kHz) and broadband lightning atmospherics (1.0-40.0 kHz) are obtained. Analyzing the VLF/LF data obtained by AVON, we estimate the reflection heights of each signal. The reflection height corresponds to variations in electron density in the D- and lower E-region ionosphere in Southeast Asia. This network system is utilized in cooperation with other ground-based and satellite-based observation projects to investigate energetic-particle precipitation effects on low-latitude ionosphere. In the presentation, we introduce the AVON system and show the results of a magnetic storm of 2-12 May 2010, total solar eclipse of 22 July, 2009, and long recovery events of LF transmitter signals.

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PEM10-10 Room:102A Time:May 25 11:30-11:45

Study of magnetosphere-ionosphere-thermosphere coupling using the SuperDARN Hokkaido radar

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Super Dual Auroral Radar Network (SuperDARN) is a powerful tool for studying magnetosphere-ionosphere-thermosphere coupling with various spatial temporal scales. Recent deployment of mid-latitude SuperDARN radars such as Hokkaido, has made it possible to study a great variety of processes at subauroral and mid latitudes as well as auroral latitudes. In this paper we will present overview of the SuperDARN Hokkaido radar, which is the 2nd mid-latitude SuperDARN radar and the only one in the Asian region. The SuperDARN Hokkaido radar began operation in November 2006, and has been working for more than 5 years. Using the radar data total of 15 papers has been published so far. In the presentation we will show main scientific results using the radar, ranging from the magnetosphere, ionosphere to the thermosphere and upper mesosphere at mid- and subauroral latitudes. We will also present future perspectives, including plans of building a new radar in Hokkaido, covering the region to the west of the present Hokkaido radar FOV and adjacent to FOVs of Russian SuperDARN radars now under construction.

Keywords: SuperDARN Hokkaido radar, magnetosphere-ionosphere-thermosphere coupling, CAWSES

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PEM10-11 Room:102A Time:May 25 11:45-12:00

Report of the STEL optical observation at the Tromsoe EISCAT radar site by March 2012

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Solar-Terrestrial Environment Laboratory (STEL) has operated various kinds of optical instruments for more than 10 years at the Tromsoe EISCAT (European Incoherent Scatter) radar site in Norway (69.6^{o}N, 19.2^{o}E), which is one of the state-of-art observatories at high latitudes. Five instruments are now in automatic operation regularly from October to March: (1) three-wavelength photometer (427.8 nm, 630.0 nm, and 557.7 nm), which is fixed to look along the magnetic field line, (2) digital camera for monitoring weather and aurora, (3) proton all-sky camera (486.1 nm), (4) multi-wavelength all-sky camera (557.7 nm, 630.0 nm, OH band, 589.3 nm, 572.5 nm, and 732.0 nm), and (5) Fabry-Perot interferometer (557.7 nm, 630.0 nm, and 732.0 nm). While these instruments are programmatically operated, they have contributed to many campaign observations with the EISCAT radars, rockets, satellites, and other ground-based instruments by adjusting the observation modes. The quick looks are available on the web at www.stelab.nagoya-u.ac.jp/~eiscat/data/EISCAT.html. This paper reports activity of the optical instruments including the data archive and notable events during some Japanese special programs of the EISCAT radar.

Keywords: Aurora, Airglow, Optical instrument, Ionosphere, Thermosphere, Polar region

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PEM10-12 Room:102A Time:May 25 13:45-14:00

Performance of Neural Network based Ionospheric Tomography

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Three-dimensional ionospheric tomography is effective for investigations of the dynamics of ionospheric phenomena. However, it is an ill-posed problem in the context of sparse data, and accurate electron density reconstruction is difficult. A neural network tomographic approach, a multilayer neural network trained by minimizing an objective function, allows reconstruction of sparse data. In this study, we validate the reconstruction performance of the developed algorithm using numerical simulations. Then we apply it to the practical data observed in March 2011, Japan.

Keywords: ionospheric tomography, Neural Network

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PEM10-13 Room:102A Time:May 25 14:00-14:15

Recent developments of Pi2 research

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More than half a century after the discovery of Pi2 pulsations (ultra-low frequency waves with periods of 40 to 150 s), Pi2 research is still vigorous and evolving. Especially in the last decade, new results have provided supporting evidence for some Pi2 models, challenged earlier interpretations, and led to entirely new models. We have gone beyond the inner magnetosphere and have explored the outer magnetosphere, where Pi2 pulsations have been observed in unexpected places. The new Pi2 models cover virtually all magnetotail regions and their coupling, from the reconnection site via the lobes and plasma sheet to the ionosphere. In addition to understanding the Pi2 phenomenon in itself, it has also been important to study Pi2 pulsations in their role as transient manifestations of the coupling between the magnetosphere and the ionosphere. The transient Pi2 is an integral part of the substorm phenomenon, especially during substorm onset. Key questions about the workings of magnetospheric substorms are still awaiting answers, and research on Pi2 pulsations can help with those answers. In this talk, I will review recent developments of the ballooning-driven Pi2 model.

Keywords: Pi2 pulsation, ULF wave, magnetosphere-ionosphere coupling

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PEM10-14 Room:102A Time:May 25 14:15-14:30

Middle and upper atmosphere profiling over Syowa station, Antarctic

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The polar middle atmosphere is located in the downward/upward stream of the meridional circulation in winter/summer, and shows a significant seasonal change of temperature in the upper region. The cold mesopause in summer and related phenomena such as PMC (polar mesospheric clouds), NLC (noctilucsent clouds), and PMSE (polar mesospheric summer echo) are the most outstanding signals caused by such large amplitude seasonal variations. However, observations of the dynamics and chemistry in the Antarctic middle atmosphere are still very limited.

The National Institute of Polar Research (NIPR) is leading a six year prioritized project of the Antarctic research observations since 2010. One of the sub-project is entitled “the global environmental change revealed through the Antarctic middle and upper atmosphere.” Profiling dynamical parameters such as temperature and wind, as well as minor constituents is the key component of observations in this project, together with a long term observations using existent various instruments in Syowa, the Antarctic (39E, 69S). Active remote sensings such as a large atmospheric radar (PANSY) and a lidar, as well as profiling of minor constituents by a millimeter wave spectrometer are being installed in Syowa, Antarctica. In this paper, we overview the instrumentation of this project, and results from the first season will be reported. PANSY radar is an MST/IS radar with 47 MHz VHF frequency and 500 kW peak transmission power. The antenna array consists of 1045 crossed Yagi antennas. The lidar system installed in early 2011 is a Rayleigh/Raman lidar, at 355 nm transmission with 6 W average power. The receiver telescopes are with 82 cm and 35.5 cm diameters. A millimeter-wave spectroscopic radiometer for continuous profiling of minor constituents at Syowa Station has been developed as a low electric power consumption system. These new additional instruments for profiling the middle atmosphere are expected to provide valuable information on variabilities of the Antarctic and global atmosphere.

Keywords: middle atmosphere, upper atmosphere, Antarctic, radar, lidar, ground-based observation