Variability of the Sun and Its Terrestrial Impact (VarSITI)
SEE / ISEST-Minimax24 / SPeCIMEN / ROSMIC
http://www.varsiti.org/

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VarSITI Newsletter

Inside this issue

Project ISEST/ROSMIC

Article 1:

Space Weather Research Activity in National Space Agency (ANGKASA), Malaysia

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Nyanasegari Bhoo Pathy


Mhd Fairos Assilam


Tajul Ariffin Musa

In 2005, Malaysia established the Langkawi National Observatory (LNO). The facility comes with a 50 cm Ritche-Chriterien robotic telescope that can be controlled remotely through the Internet and also a robotic 15 cm multi apo-chromatic refracting telescope. The 50 cm robotic telescope is capable of gathering data for scientists around the world who are involved in the field of photometry, spectroscopy and astrometry. Langkawi National Observatory also has a 15 cm apo-chromatic telescope. This telescope is capable of gathering data on three different wavelengths namely solar continuum, H-alpha and Calcium K lines,

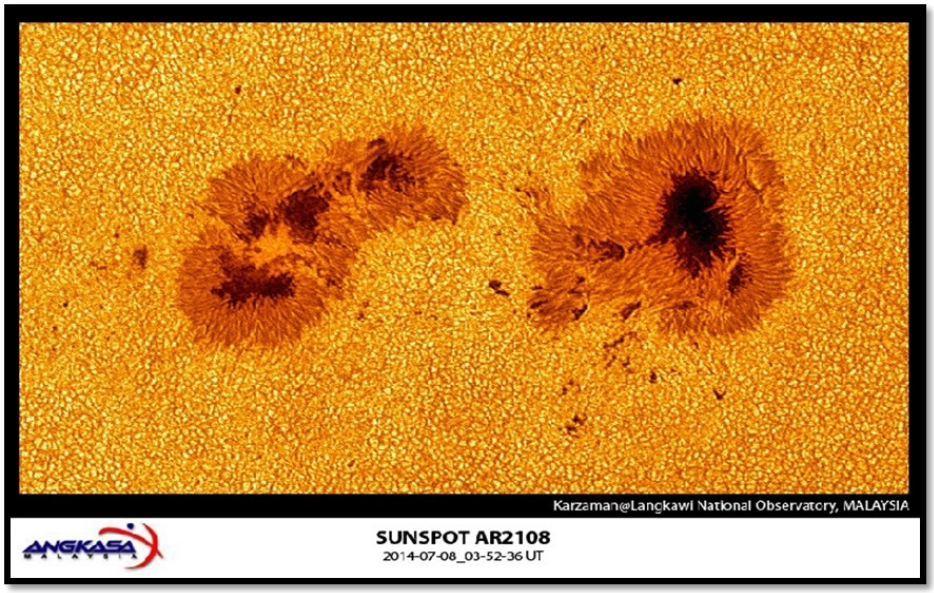


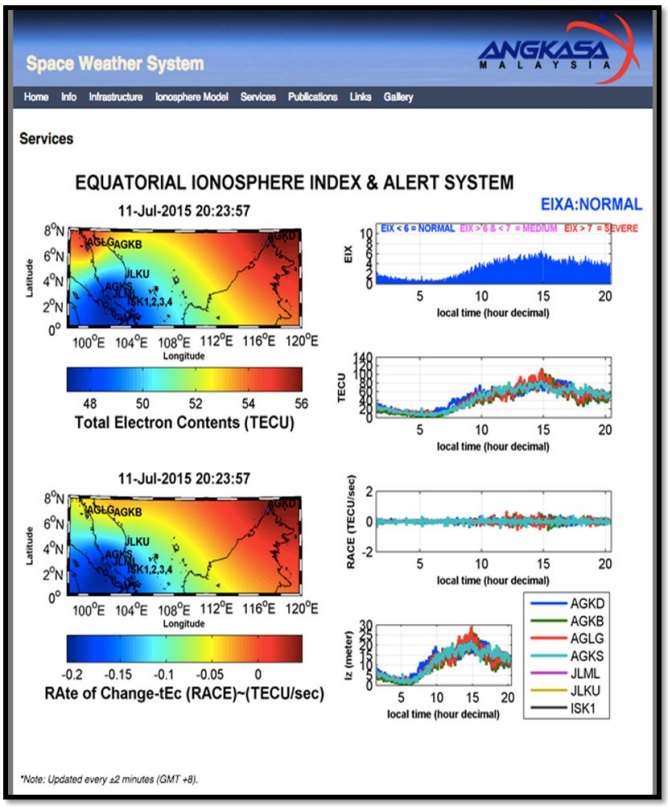
Figure 1. Sunspot AR2108 captured by Langkawi National Observatory (LNO), National Space Agency of Malaysia (ANGKASA) on 08 July 2014.

which provide sunspot numbers. Sunspot AR2108 captured by the LNO on 08 July 2014 is shown in ***Figure 1***.

In conjunction with the International Heliophysical Year, Malaysia participated in the MAGDAS Network by setting up a station in LNO on September 2006. This project is a joint project between ANGKASA, National University of Malaysia (UKM) and International Centre for Space Weather Science and Education (ICSWSE), Kyushu University, Japan. Malaysia hosted a few scientific instruments such as CALLISTO, SID and AGRESS via the platform provided by **International Space Weather Initiatives (ISWI)**. We are thankful for the great opportunity given by ISWI to Malaysia. The ISWI had indeed played an important role in capacity building in our part of the world in terms of processing, assimilating and analysing complex space weather data collected by these instruments.

Figure 2. GNSS CORS Station at Langkawi National Observatory (LNO).

Space weather effects over Malaysian sector is largely unknown due to scarcity of data and lack of understanding on the ionosphere in the equatorial region. In 2012, ANGKASA started to set up a few Global Navigation Satellite System (GNSS) continuously operating reference stations (CORS) to monitor the ionosphere via a number of research projects funded by Ministry of Science, Technology and Innovation as shown in ***Figure 2***. To date, we have successfully developed our GNSS CORS Scientific Network in collaboration with GNSS and Geodynamics Research Group (GnG), Universiti Teknologi Malaysia (UTM). Through this network we have developed a web-based platform called **"Iono Web Service"** which provides the **First Near Real Time (NRT) Ionospheric Monitoring Facility for Malaysia** as shown in ***Figure 3***. This system is capable of providing information on Total Electron Content (TEC) and the delay error to Global Positioning System (GPS) satellite signal and rate of TEC change for Malaysian users in near real time. We are also working on developing our own **Equatorial Ionosphere Index and Alert (EIXA)** system to support space weather fundamental research and services. The computation of the TEC and EIXA is based on 1Hz GPS data from the CORS network. Nevertheless, the web service update rate is about 1minute following few computations processes such as estimation of CORS receiver differential code bias and interpolation of TEC value.



Click to our website : www.angkasa.gov.my to access to this Service starting 31st August 2015

Figure 3. Iono Web Service (1st Near Real Time Ionospheric Monitoring Facility in Malaysia) developed by ANGKASA and UTM.

The growth of technology has left the society exposed to higher risk from space weather. Investments by global community into space weather research and technologies are rapidly advancing the state of knowledge and shows promising result in improving space weather prediction capabilities. In Malaysia, we are keen on moving ahead to develop our capability in monitoring and forecasting the effects from space weather with the combination of our solar telescope system, MAGDAS, ISWI instruments, GNSS CORS Scientific Network and ground/space data provided by international entities. ANGKASA is working on a strong commitment with collaboration from local and international research institution to set-up a Space Environment Monitoring Centre with the aim of operationalizing space weather monitoring and early warning systems in Malaysia in the not too distant future.

For further information, please refer to the presentation slide on Malaysia Space Weather Activities published in UN/Japan Space Weather Workshop Website (http://newserver.stil.bas.bg/ISWI/Outreach/2015mar3/Ses22Pathy.pdf).

Highlight on Young Scientists 1:

Numerical and Observational Investigation of Active Region Formation of the Sun

Shin Toriumi

Shin Toriumi
National Astronomical Observatory of Japan,
Tokyo, Japan

It is now widely accepted that solar active regions (ARs) including sunspots are produced by magnetic flux transported from the deeper convection zone. Such ARs may perturb the solar-terrestrial environments by causing flares and CMEs. Therefore, it is of great importance to investigate the magnetic flux emergence and resultant AR formation.

For this purpose, we conducted a comparative study of magnetohydrodynamic simulation and observational data analysis, which is shown as Figure 1. Here, the numerical simulation indicates that the magnetic flux rises through the convection zone at the speed of about 1 km/s with a slight deceleration. This behavior is also seen in the helioseismic detection of an emerg-

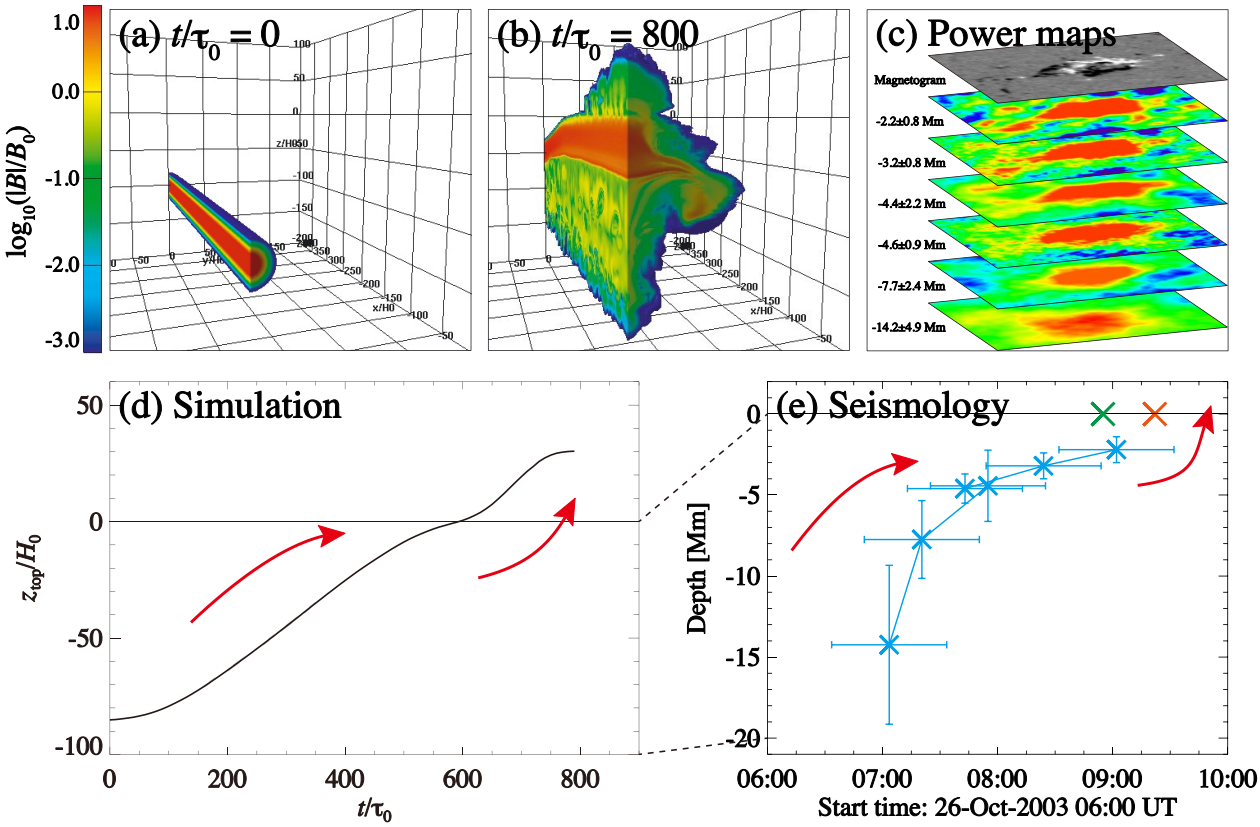


Figure 1. Comparative study of magnetic flux emergence. (a and b) 3D visualizations of the simulated flux emergence. (c) Helioseismology results showing the acoustic power measurement of an emerging flux region of the Sun. (d and e) Height-time evolutions of simulated and observed flux emergence events. Normalization units are H_0=200 km for length, tau_0=25 s for time, and B_0=0.03 Tesla for field strength. Figures reproduced from Toriumi & Yokoyama (2012) and Toriumi et al. (2013).

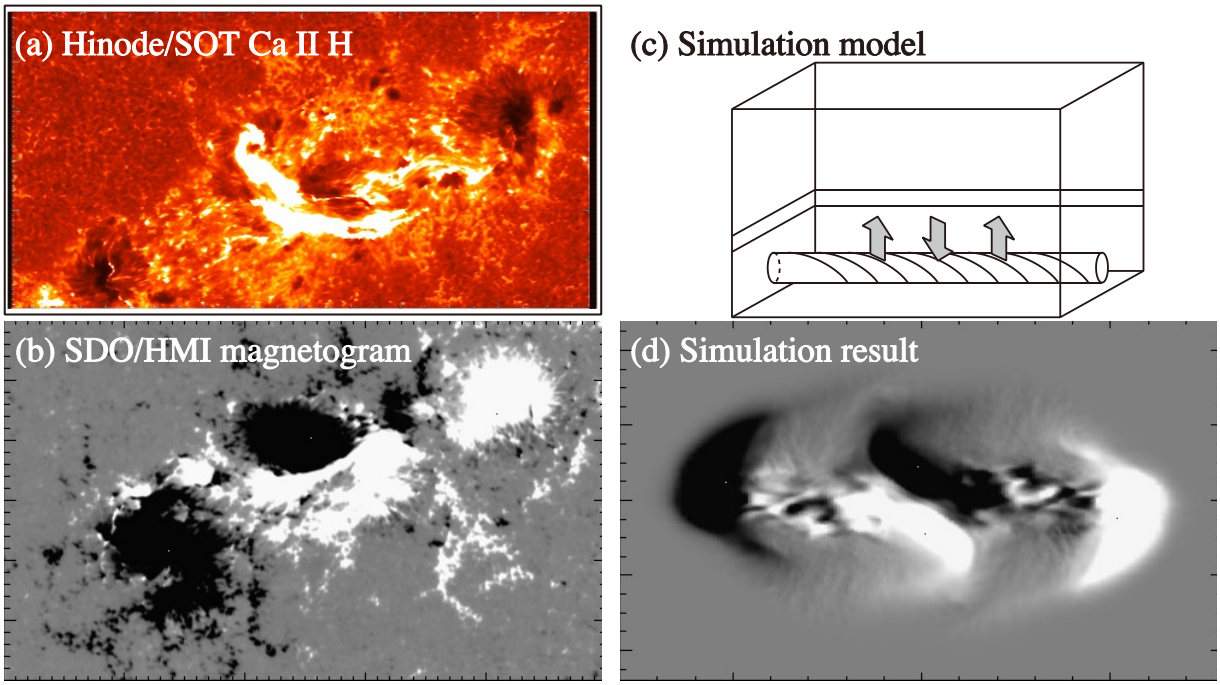


Figure 2. Observation and simulation of NOAA AR 11158, which appeared in February 2011. (a) Hinode observation of an M2.2-class event. (b) SDO observation of a surface magnetic field: white and black indicate positive and negative polarities, respectively. (c) Simulation model that a single horizontal flux tube rises at two sections. (d) Simulation result showing a magnetic configuration similar to the observation. Figures reproduced from Toriumi et al. (2014).

ing flux in the actual Sun. What we can learn from this comparative study is that the combination of numerical and observational investigations may open the door to understanding of subsurface magnetic fields. Moreover, numerical simulations may be powerful tools to reveal the cause of solar flares. Figure 2 shows that the observed flaring AR is possibly produced from a single subsurface flux tube rising at two sections. The shear motion of two central polarities triggered magnetic reconnection, resulting in a series of strong flares including an X2.2-class event.

Reference

Toriumi & Yokoyama (2012), Large-scale 3D MHD simulation on the solar flux emergence and the small-scale dynamic features in an active region, Astronomy & Astrophysics, 539, doi:10.1051/0004-6361/201118009.

Toriumi et al. (2013), Probing the Shallow Convection Zone: Rising Motion of Subsurface Magnetic Fields in the Solar Active Region, Astrophysical Journal Letters, 770, doi:10.1088/2041-8205/770/1/L11.

Toriumi et al. (2014), Formation of a Flare-Productive Active Region: Observation and Numerical Simulation of NOAA AR 11158, Solar Physics, 289, doi:10.1007/s11207-014-0502-1.

Highlight on Young Scientists 2:

A brief professional bio of Dr. Drew L. Turner

Drew Turner

Drew Turner
The Aerospace Corporation in El Segundo, Los Angeles, CA, USA

Dr. Drew L. Turner's primary research interests include the physics of energetic (i.e., >~10 keV) particles in space plasmas, small-satellite (e.g., CubeSat) mission design, and the design of scientific instrumentation for satellites. Dr. Turner analyzes particle, plasma, fields, and waves data from NASA's

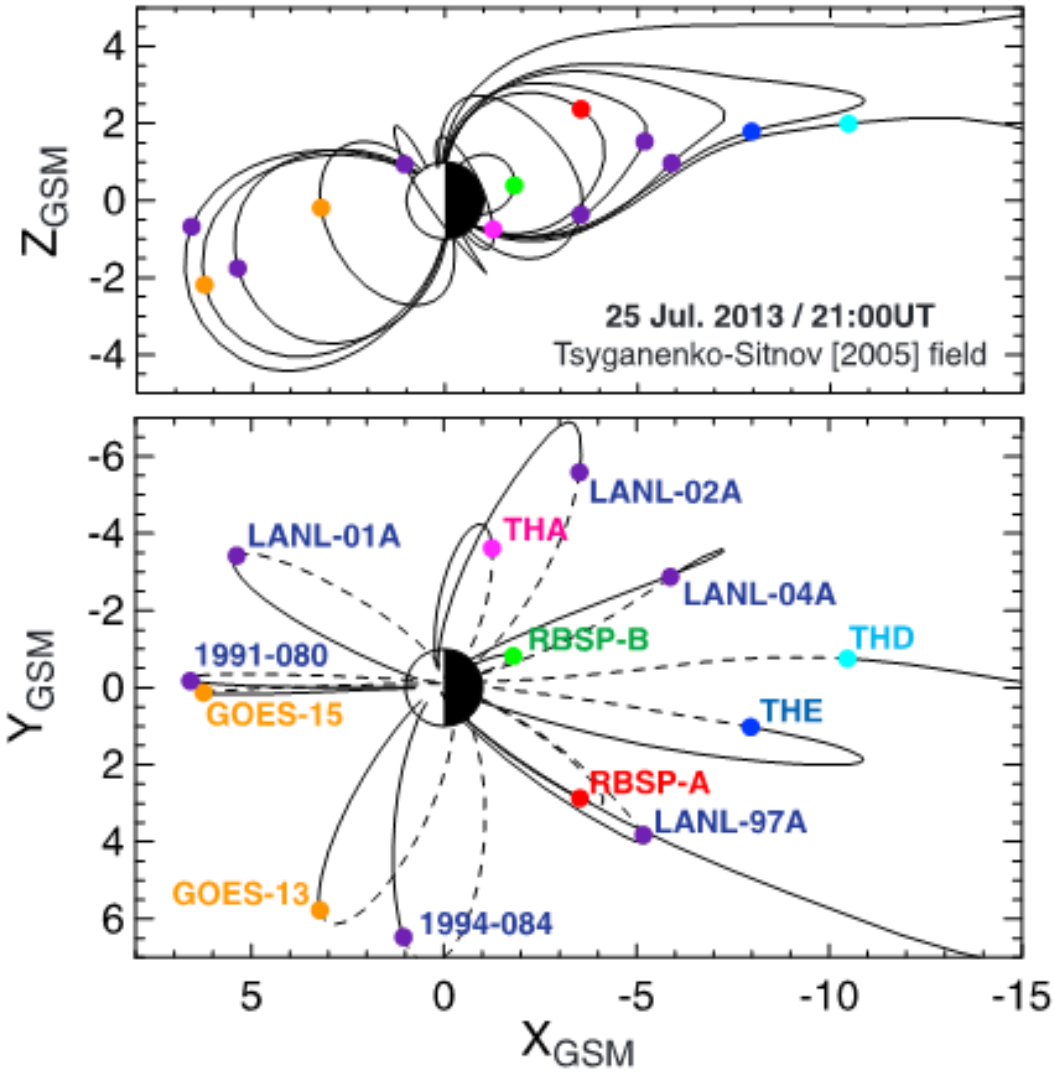


Figure 1. Constellation of magnetospheric spacecraft used to study energetic particle injections into Earth's radiation belts. Figure 1 from Turner et al. [GRL 2015].

THEMIS and Van Allen Probes missions plus LANL's geosynchronous spacecraft and NOAA's GOES and POES constellations (e.g., Figure 1). With these combined datasets, Dr. Turner and colleagues address important questions concerning the dominant source, loss, and transport processes of relativistic electrons in Earth's radiation belts. He also uses the THEMIS dataset to better understand particle acceleration and transient kinetic phenomena in Earth's ion foreshock. During his graduate studies (at Univ. of Colorado) and early career (at UCLA), Dr. Turner was privileged with the opportunities to work directly on the mission design and science payloads for the Colorado Student Space Weather Experiment (CSSWE) and UCLA's Electron Losses and Fields Investigation (ELFIN) CubeSat missions. Now as a young scientist at The Aerospace Corporation in El Segundo (Los Angeles), California, Dr. Turner divides his time between data analysis (primarily in Earth's radiation belts and ion foreshock) and the development of new instruments to observe energetic particles in near-Earth space.

Project ROSMIC

Highlight on Young Scientists 3:

Effects of lower atmospheric and solar forcings on upper atmospheric dynamics

Fazlul I. Laskar
Leibniz Institute of Atmospheric Physics,
Kühlungsborn, Germany

Fazlul I. Laskar

Earth's upper atmospheric behavior has traditionally been considered to be influenced by solar forcing. Owing to the daytime thermospheric optical dayglow emission measurements carried out over a long duration that it has been possible to obtain signatures of planetary scale waves, originating lower below, in the upper atmosphere. My thesis work has enabled the characterization of this forcing from below on the upper atmosphere and showed that it is greater during low solar activity. Further, sudden stratospheric warming (SSW) events have also been shown to have significant effect on low-latitude dynamics (Figure 1), wherein concomitant variations can be noted between SSW temperature enhancement (ΔT) and spectral powers of quasi-16-day waves in the equatorial electroject (EEJ) and total electron content (TEC). Using low-latitude thermospheric dayglow emissions and satellite-based meso-

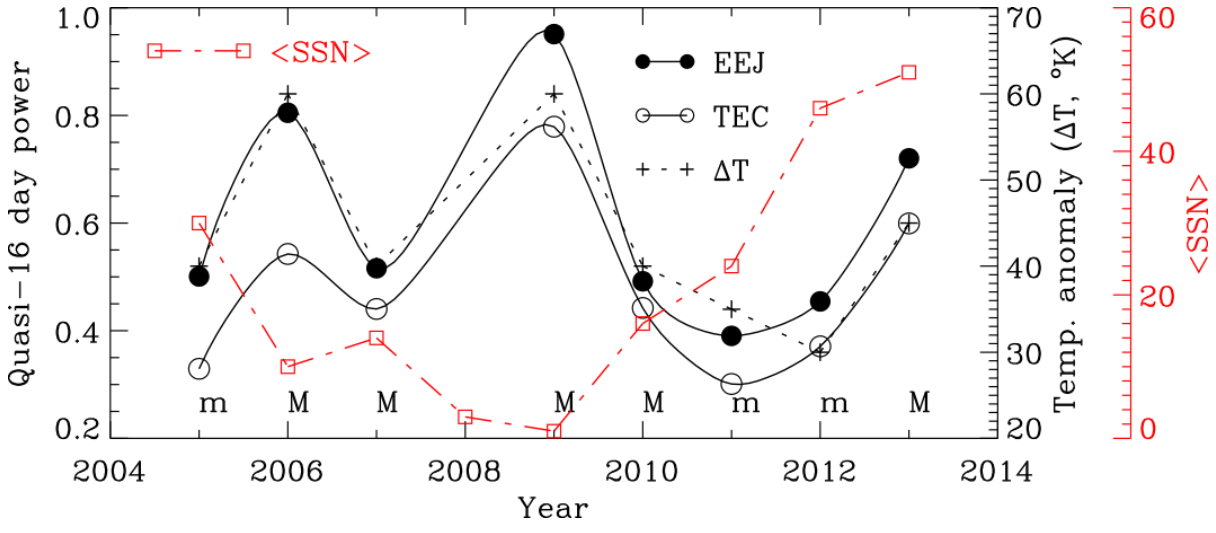


Figure 1. SSW-time ΔT, average sunspot number (SSN) during our observation durations (January- February), and spectral power of quasi-16-day waves in TEC and EEJ (Laskar et al., 2014).

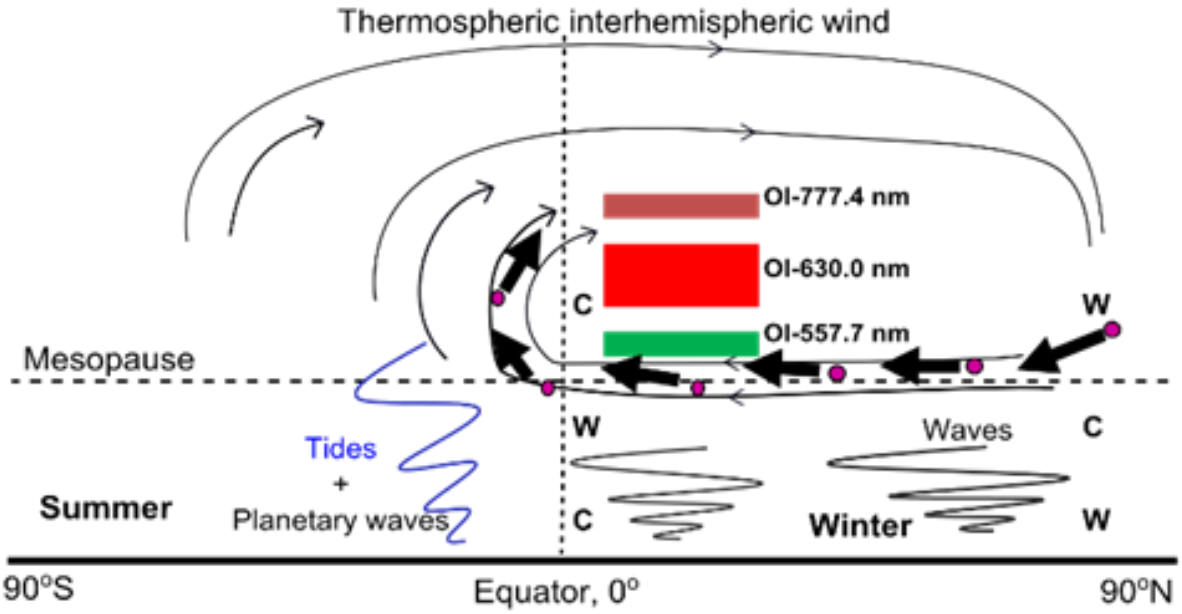


Figure 2. Schematic of the proposed meridional circulation cell during SSW events (Laskar and Pallamraju, 2014).

sphere-thermosphere global winds and temperatures for four SSW events during 2010-2013, evidence has been obtained for the existence of a new circulation that seems to occur around SSW events. Figure 2 shows a schematic of the proposed circulation, wherein the observed enhancements in the dayglow emissions over low-latitude have been attributed to the equatorward wind which transports atomic oxygen from high-to-low latitudes. These works were carried out during my PhD at Physical Research Laboratory, Ahmedabad, India. Currently I continue working on such ROSMIC related activities at the Leibniz Institute of Atmospheric Physics.

References:

Laskar, F. I., D. Pallamraju, and B. Veenadhari (2014), Vertical coupling of atmospheres: Dependence on strength of sudden stratospheric warming and solar activity, Earth, Planets and Space, 66 (1), 94, doi:10.1186/1880-5981-66-94.

Laskar, F. I., and D. Pallamraju, (2014), Does sudden stratospheric warming induce meridional circulation in the mesosphere thermosphere system? J. Geophys. Res. Space Physics, 119 (12), 10,133-10,143, doi:10.1002/2014JA020086.

Project ROSMIC

Meeting Report 1:

ROMIC (Role Of the Middle atmosphere In Climate) Seminar

Franz-Josef Lübken

Franz–Josef Lübken
Leibniz Institute of Atmospheric Physics, Kühlungsborn, Germany

A status seminar for the German research program ROMIC (Role Of the Middle atmosphere In Climate) took place on 28/29 May 2015 at the Leibniz Institute of Atmospheric Physics (IAP) in Kühlungsborn. ROMIC is funded by the German Federal Ministry of Education and Research (BMBF) and consists of 18 projects at 15 institutes in Germany with a total budget of 8 Mio Euro for a period of three years. A total of approximately 80 scientists and students participated in the meeting

Figure 1. Participants of ROMIC Seminar.

and reported about recent progress made regarding measurements and modelling for an improvement of climate research in the middle atmosphere. A rather large range of science topics was covered including long term variability and trends of temperatures, dynamics, mesospheric ice clouds, hydroxyl emissions, and stratospheric aerosols, as well as various coupling mechanisms and the variation of solar spectral irradiance and its impact on the middle atmosphere. More information about ROMIC including science objectives and results can be found on the ROMIC wegpage at https://romic.iap-kborn.de/index.php?id=9.

Project SPeCIMEN

Meeting Report 2:

Energetic particle Precipitation into the Atmosphere Symposium at IUGG

Bernd Funke

Bernd Funke
Instituto de Astrofísica de Andalucía, CSIC, Granada , Spain

The symposium "Energetic Particle Precipitation into the Atmosphere: Sources and Atmospheric Impact" was held at the 26th IUGG General Assembly in Prague on 26 June 2015. The sixteen oral and three poster presentations addressed the precipitation drivers, the nature of the particle fluxes, and the impact of the precipitation on the ionosphere or atmosphere by means of satellite/ground-based and experimental observations, as well as theoretical investigations. A particular focus was given to observations of particle fluxes and atmospheric chemical changes caused by energetic particles, as well as approaches showing how electron precipitation impacts can be applied by the atmospheric community. These topics are of high relevance for VarSITI's ROSMIC and

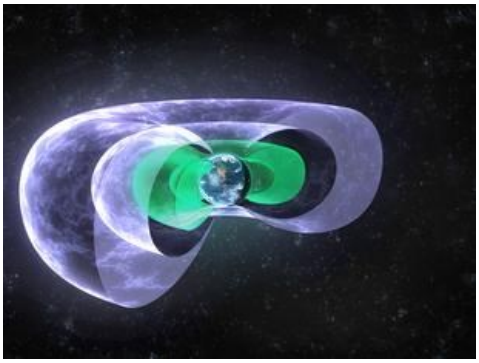


Figure 1. A cartoon schematic of the inner (green) and outer (purple) radiation belts which surround the Earth. Our session was particularly focused on the measurement and impact of the losses of electrons from the outer belt into the polar atmosphere (image credit: A. Kale, University of Alberta).

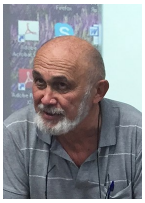
SPeCIMEN Projects. Invited speakers were Ethan Peck (USA) who reported on his work on improving the use of POES electron fluxes, and Monika Andersson (Finland) who presented her work on OH and O3 variations induced by energetic electron precipitation in the mesosphere, recently published in Nature Communications. Speakers in the session ranged from Europe, North America, South America and Oceania. It was notable that the audience included scientific leaders from both the radiation belt and atmospheric community, and that the audience stayed right to the end of the final talk despite refreshments having started outside ~15min beforehand.

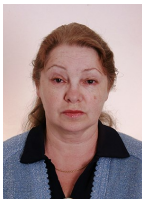
Project SEE

Meeting Report 3:

International Conference "Superflares and Activity of the Sun in the Cycle Formation Epoch"

L. Pustil'nik[1] and M. Katsova[2]
[1]Israel Cosmic Ray and Space Weather Center, Tel Aviv University, Tel Aviv, Israel
[2]Sternberg State Astronomical Institute, Lomonosov Moscow State University, Russia


Lev Pustil'nik


Maria Katsova

At present, non-stationary phenomena of total energies up to 1000 times stronger than solar flares are found on solar-like stars. Such superflares occur more often on stars which are significantly younger than the Sun. This new observational information required joint efforts of astronomers in the field of heliophysics, stellar astrophysics and solar-terrestrial connections in order to indentify the character of activity on the young Sun. The invited talks of participants from Germany, Japan, Russia, Finland, Hungary, and Israel presented reviews dedicated to an evolution of stellar activity, determination of ages of stars, observations and theory of superflares, spottedness of stars with activity cycles. Despite limited numbers of participants (20 scientists), very interesting debates on activity of the young Sun with participation of a few PhD students and postdocs were quite productive. Perspective investigations which are essential for study and forecast of the space weather and its effects on geo- and biosphere were discussed. The conference held in Golan Research Institute (Katzrin) and in Israel Cosmic Ray and Space Weather Center (Tel Aviv University), where several reviews dedicated the observational and theoretical aspects of the magnetic cycle on the Sun were presented. The site of the conference is: http://www.tau.ac.il/institutes/advanced/cosmic/Conferences/2015-VarSITI_Superflares/VarSITI-2015_ISR.html.

Figure 1. Group photo of the participants.

Project ROSMIC

Meeting Report 4:

IUGG 2015 symposium A15 "Long-Term Trends in the Stratosphere, Mesosphere, Thermosphere and Ionosphere"

Jan Lastovicka
Institute of Atmospheric Physics, Prague, Czech Republic


Jan Lastovicka

12 oral papers (including 4 solicited) and 10 posters were presented at this well-attended symposium (> 50 participants) co-organized by the SCOSTEP/VarSITI/ROSMIC WGs 3 and 4. The symposium brings interesting new results, among others: Midlatitude ozone recovers to the 1980 level in coming decades, Atlantic ozone in the mid-2100, and equatorial ozone never due to acceleration of the Brewer-Dobson circulation of greenhouse gas origin (Hegglin). Trends in the mesopause region winds changed substantially in the mid-1990, probably in response to change in ozone trend (Jacobi). Measurements by SABER and ACE/FTS show that trends in CO2 concentration are remarkably increasing with height in 80-110 km (Rezac). Model GAIA provides trends of neutral temperature Tn in the thermosphere, which are below ~300 km in reasonable agreement with observed trends in ion temperature Ti (Miyashi). However, Ti trends at altitudes above 300 km differ principally up to sign (see Figure) (Lastovicka).

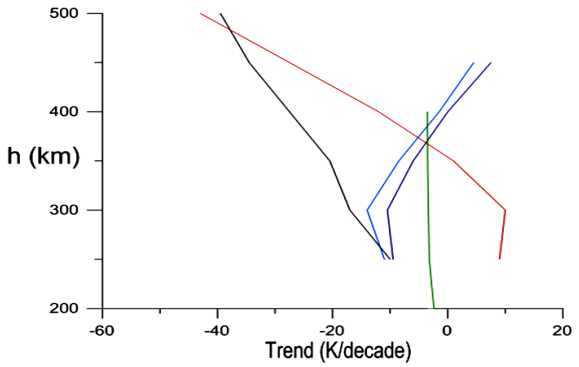


Figure 1. Height profiles of trends of Ti at Millstone Hill (black – noon; red – midnight; Zhang and Holt, 2013), of noontime Ti at EISCAT (light blue with MgII, black-blue with F10.7; Ogawa et al., 2014), and green of Tn at noon (model of Solomon et al., 2015).

Meeting Report 5:

Session A4 'Geospace over and related to the Arctic region' at ISAR-4 (International Symposium on Arctic Research-4)

Takuji Nakamura[1], Yasunobu Ogawa[1], Ryuho Kataoka[1], Yoshimizu Miyoshi[2], Craig Heinselman[3] and Esa Turunen[4]

[1]National Institute of Polar Research, Tokyo, Japan
[2]Solar-Terrestrial Environment Laboratory, Nagoya University, Nagoya, Japan
[3]European Incoherent Scatter Scientific Association, Kiruna, Sweden
[4]Sodankylä Geophysical Observatory, Sodankylä, Finland

Many phenomena in the near-earth space environment (Geospace) significantly affect human activities and social infrastructures in the Arctic regions. In ISAR-4 of ASSW (Arctic Science Summit Week) 2015 of IASC under ICSU, held in Toyoma, Japan on April 23-30, 2015, a session entitled 'Geospace over and related to the Arctic region (A4)' was organized as an international forum to discuss recent progress in this area and to advance the operation and development of essential research infrastructures. Fifteen oral talks and fourteen posters were presented with more than 40 audience. An open side meeting was also held with 26 attendees, with short reports from each institution and short poster introductions. Most of the attendees continued fruitful discussions on recent progress and further collaborations in the following dinner party at a local restaurant. Five young scientists received partial travel support by the ROSMIC/VarSITI, and presented their papers.

Figure 1. Left: participants of ISAR-14. Right: the recipients of travel support by VarSITI/ROSMIC.

Upcoming meetings related to VarSITI

Conference	Date	Location	Contact Information
Asia Osceania Geosciences Society (AOGS) 12th Annual Meeting	Aug. 2-7, 2015	Suntec City, Singapore	http://www.asiaoceania.org/society/index.asp
12th International Workshop on Layered Phenomena in the Mesopause Region (LPMR) 2015	Aug. 10-13	Boulder, CO, USA	http://cires.colorado.edu/events/lpmr/
Unsolved Problems in Magnetospheric Physics (UPMP) Workshop	Sep. 6-11, 2015	Scarborough, UK	http://spacescience.org/upmpw/
International School on Equatorial and Low-Latitude Ionosphere (ISELLI)	Sep. 14-18, 2015	Abuja, Nigeria	http://newserver.stil.bas.bg/varsiti/Meetings/school2015_ISELLI.html
SCOSTEP-WDS Workshop- “Global Data Activities for the Study of Solar-Terrestrial Variability”	Sep. 28-30, 2015	Tokyo, Japan	http://isds.nict.go.jp/scostep-wds.2015.org/.
Coimbra Solar Physics Meeting "Ground-based Solar Observation in the Space Instrumentation	Oct. 5-9, 2015	Coimbra, Portugal	http://www.mat.uc.pt/~cspm2015/overview.html
14th International Symposium on Equatorial Aeronomy	Oct. 19-23, 2015	Bahir Dar, Ethiopia	http://www.bdu.edu.et/isea14/
International Study of Earth-affecting Solar Transients (ISEST/MiniMax24) Workshop	Oct. 26-30, 2015	National Autonomous University, Mexico	http://cintli.geofisica.unam.mx/congreso/
Solar Variability and its Heliospheric Effects	Nov. 2-6, 2015	Athens, Greece	http://bbc-sws.astro.noa.gr/
International Reference Ionosphere 2015 Workshop	Nov. 2-13, 2015	Bangkok, Thailand	http://www.iri2015.kmitl.ac.th
2015 Sun-Climate Symposium	Nov. 10-13, 2015	Savannah, GA, USA	http://lasp.colorado.edu/home/sorce/news-events/meetings/2015-sun-climate-symposium/
AGU Fall Meeting	Dec. 14-18, 2015	San Francisco, CA, USA	http://fallmeeting.agu.org/2015/
The First VarSITI General Symposium	Jun. 6-10, 2016	Bulgaria	VarSITI co-chair
6th International HEPPA-SOLARIS Workshop	Jun. 13-17, 2016	Helsinki, Finland	http://heppa-solaris-2016.fmi.fi/

The purpose of the VarSITI newsletter is to promote communication among scientists related to the four VarSITI Projects (SEE, ISEST/MiniMax24, SPeCIMEN, and ROSMIC).

The editors would like to ask you to submit the following articles to the VarSITI newsletter.

Our newsletter has five categories of the articles:

1. Articles— Each article has a maximum of 500 words length and four figures/photos (at least two figures/photos). With the writer's approval, the small face photo will be also added.

   On campaign, ground observations, satellite observations, modeling, etc.

2. Meeting reports—Each meeting report has a maximum of 150 words length and one photo from the meeting.

   On workshop/conference/ symposium report related to VarSITI

   With the writer's approval, the small face photo will be also added.

3. Highlights on young scientists— Each highlight has a maximum of 200 words length and two figures. With the writer's approval, the small face photo will be also added.

   On the young scientist's own work related to VarSITI

4. Short news— Each short news has a maximum of 100 words length.

   Announcements of campaign, workshop, etc.

5. Meeting schedule

Category 3 (Highlights on young scientists) helps both young scientists and VarSITI members to know each other. Please contact the editors if you know any recommended young scientists who are willing to write an article on this category.

TO SUBMIT AN ARTICLE

Articles/figures/photos can be emailed to the Newsletter Secretary, Ms. Mai Asakura (asakura_at_stelab.nagoya-u.ac.jp). If you have any questions or problem, please do not hesitate to ask us.

SUBSCRIPTION - VarSITI MAILING LIST

The PDF version of the VarSITI Newsletter is distributed through the VarSITI mailing list. The mailing list is created for each of the four Projects with an integrated list for all Projects. If you want to be included in the mailing list to receive future information of VarSITI, please send e-mail to "asakura_at_stelab.nagoya-u.ac.jp" (replace "_at_" by "@") with your full name, country, e-mail address to be included, and the name of the Project you are interested.

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