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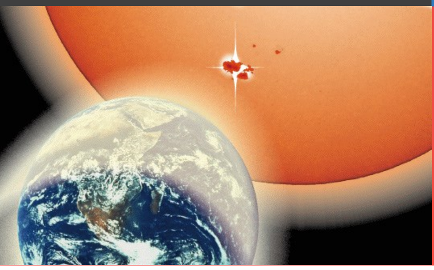

VarSITI Newsletter

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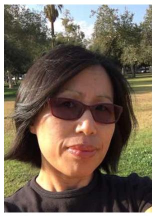
VarSITI

Article 1:

The Community Coordinated Modeling Center: A Hub & A Community Resource


Yihua Zheng

Y. Zheng[1], M. M. Kuznetsova[1], M. L. Mays[1], A. A. Pulkkinen[1], C. Wiegand[1] and CCMC team
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I. INTRODUCTION

The Community Coordinated Modeling Center (CCMC) was established as a strategic investment into the National Space Weather Program in the U.S. and was designated as a long-term, flexible solution for maximizing the return on investments in model development, while accelerating the transition of models from research to operations (https://ccmc.gsfc.nasa.gov/). The CCMC serves as a hub interconnecting all key elements of the space weather capability system: observations, modeling, research, and operations.

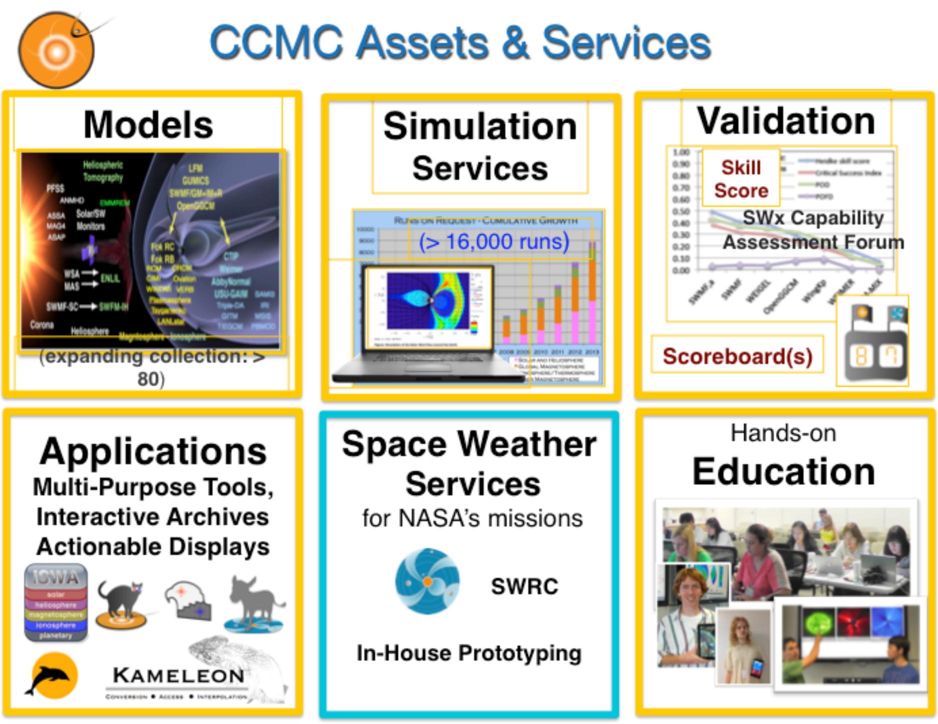

Figure 1. CCMC Assets and Services.

II. CCMC ASSETS AND SERVICES

The main assets and services of CCMC can be categorized as follows: Models, Simulation Services, Validation, Applications (including multipurpose tools, interactive archives, actionable displays), Space Weather Services and Education (as shown in Figure 1).

III. HIGHLIGHTS

Due to space limitation, only two items are highlighted here. One is the newly launched International Forum for Space Weather Modeling Capabilities Assessment under 'Validation' and the other is the one-day space weather school prior to an international science meeting, along with two hands-on sessions during the meeting.

A. Forum

The CCMC has been engaged in multifaceted model evaluation and validation efforts: 1. Independent evaluations in support of research model transitions to operations and operational model upgrades; 2. Community-wide modeling challenges through the CEDAR, GEM and SHINE science programs; 3. Research assessment of real-time forecasts via different scoreboards, such as CME arrival scoreboard (https://kauai.ccmc.gsfc.nasa.gov/CMEscoreboard/), flare scoreboard (https://ccmc.gsfc.nasa.gov/challenges/flare.php), SEP scoreboard (https://ccmc.gsfc.nasa.gov/challenges/sep.php), and possible other types of scoreboards in the future; 4. The newly launched international forum for space weather modeling capabilities assessment.

The goals of the "International Forum for Space Weather Modeling Capabilities Assessment" are to define metrics to assess the current state of space weather modeling capabilities and to help capture scientific progress in models that feed into operations. Model and application developers, data providers, forecasters, and end-users are working together to establish internationally recognized metrics meaningful to end-users and decision makers. The forum is a long-term activity to evaluate the current state of space environment applications, forecasting techniques, challenges in data-model comparison, uncertainties and sensitivities to external drivers, internal parameters and assumptions.

To address the goals of the forum, six physical domains were identified, with multiple working teams within each domain. Two additional teams were established to focus on information architecture and general scientific progress tracking issues common to all the physical domains. For a description of the domains, working teams, and progress reports please see https://ccmc.gsfc.nasa.gov/assessment/forum-topics.php. To jumpstart the forum, the CCMC organized the "International CCMC-LWS working meeting: Assessing Space Weather Understanding and Applications", held on April 3-7, 2017 in Cape Canaveral.

We encourage those who are interested to sign up to participate.

B. Space Weather School

The CCMC has created an exciting blend of activities that take advantage of unique, multi-faceted opportunities for hands-on education. One aspect is the Research, Education, and Development Initiative (REDI) that includes four closely interconnected components: Space Weather REDI, Career REDI, Planetarium REDI, and International REDI. Space Weather REDI aims to educate the next generation about space weather and its effects on society. Activities include the development of a modular on-line repository of space weather related educational material and hands-on exercises based on the CCMC's state-of-the-art models, tools, and systems. We continue to host Space Weather Bootcamp training for CCMC interns, spacecraft operators, educators, and other students and professionals at various technical levels. Career REDI provides undergraduate and high school students with internship opportunities beneficial for any future career pursuit. Besides the onsite 2-week long space weather bootcamp held annually, CCMC also hosts tailored short-duration bootcamps to different users groups, traveling bootcamps, as well as space weather schools prior and during part of science meetings.

Figure 2. Space Weather School in Goa, India (2016).

By leveraging CCMC's specialized space weather scientists, invited space weather experts from different organizations, and strong support from the local organizing committee/institute, a full day program covering different aspects of space weather science, effects and resources (together with two hands-on sessions throughout the week of the Science for Space Weather Workshop) held in in Goa, India, January 24 - 29, 2016 was a huge success (https://ccmc.gsfc.nasa.gov/support/ILWS/index.php). Figure 2 shows some pictures from the 2016 Goa school. The space weather school participants were mostly graduate students. A similar space weather school is to be held prior and during the 2nd VarSITI General Symposium in Irkutsk, Russia in July 2017. This space weather school has been organized in collaboration among the CCMC, the Institute of Solar-Terrestrial Physics (Irkutsk, Russia), the Center of Excellence in Space Sciences India (CESSI) and the SCOSTEP-VarSITI program. The main leads for the school are: Drs Larisa Kashapova, Dibyendu Nandi, Kazuo Shiokawa and Yihua Zheng.

ACKNOWLEDEMENT

The CCMC is a multi-agency partnership between NASA, NSF, USAF, NRO, ONR, and NOAA.

Article 2:

ISEST Working Group 4 Campaign Events Studies

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Solar transients, mainly Coronal Mass Ejections (CMEs), flares, and Corotating Interaction Regions (CIRs) are important aspects of coronal and interplanetary dynamics. CMEs are the dominant, short-term contributor because they inject large quantities of mass and magnetic flux into the heliosphere. CMEs can drive interplanetary shocks, a key source of solar energetic particles (SEPs). CMEs and their associated phenomena drive the most severe space weather at Earth.

VarSITI focuses on the period of the low solar-activity cycle 24 and its consequences at Earth. ISEST (International Study of Earth-affecting Solar Transients) is one of four VarSITI projects. Its goal is to (1) understand the origin, evolution and propagation of solar transients through the heliosphere to Earth, and (2) improve the prediction capability for the arrival of these transients and their potential impacts at Earth.

To study these issues in a global picture, the ISEST project has seven working groups (WGs). ISEST WG 4 focuses on the study of Campaign events and is led by the authors. Its task is to integrate theory, simulations and observations to better understand the chain of cause-effect activity from Sun to Earth for several carefully selected events. ISEST provides "textbook" or well understood cases to the community, but WG 4 also examines more controversial events, such as "stealth" CMEs and problem ICMEs to enhance our understanding. An emphasis of WG 4 is on why do forecasts fail and how can we improve our predictions?

Table 1. ISEST WG4 Event List.

Dates	Source	Geo-response	Dst	Kp/G Level	Forecast Success
VarSITI-wide Campaign Study Events					
*1) 2012 July 12-14	X1 flare, wave, fast CME	Shock, MC, Strong storm	-127	7/G3	Under-predicted
*2) 2012 Oct. 4-8	CME; weak surface signs.	Shock, MC, Moderate storm	-105	6+/G2	Under-predicted
3) 2013 March 15-17	M1 fl, wave, EP, IV, fast halo	Shock, MC? SEP, Strong storm	-132	6+/G2	
*4) 2013 June 1	Slow CME on 27 May? CH influence?	Cause of Strong storm unclear; CIR?	-119	7/G3	Failed-not predicted
*5) 2015 March 15-17	C9;C2 fl, wave, EP, fast CME	Shock, sheath, MC, Severe storm, FD	-223	8+/G4	Under-predicted
*6) 2015 June 21-24	2 M fls, waves, fast halo CMEs	Shock, sheath, MC, SEP, Severe storm	-204	8+/G4	Mostly successful
Other ISEST/MiniMax Study Events					
7) 2012 March 7-9	X5 flare, wave, fast CME	Shock, MC, Severe storm	-131	8/G4	
8) 2012 July 23-24	2 flares? wave, EPs	Extreme ST-A event; "Strong storm"	(Carr.-type)	---	
9) 2012 Jan. 6	CME <2000 km/s, over WL	GLE at Earth	No	---	
10) 2014 Jan. 7-9	X1 fl, wave, fast asym halo	Shock, SEP. No storm- CH deflection; AR channeling?	No	≤3	
*11) 2014 Sep. 10-13	X2 flare, wave, sym halo.	Shock, MC, Moderate Storm, FD	-75	7/G3	Over-predicted

Geo-response: MC = magnetic cloud; SEP = solar energetic particle event; CIR = corotating interaction region; GLE = ground-level event; AR = active region; CH = coronal hole; FD = Forbush decrease
* = Events featured in Webb and Nitta (Solar Phys., submitted, 2017).

Table 1 is a summary of the 11 events that have been discussed and analyzed by WG 4. These studies have resulted in many presentations and published papers. The first six events were chosen as VarSITI-wide Campaign Study Events because they had geo-effects of interest to one or more of the other three VarSITI projects. Five of these events plus the 10-13 September 2014 event were recently analyzed for a paper submitted to the Topical Issue on "Earth-affecting Solar Transients" (Webb and Nitta, 2017) for the Solar Physics journal. The goal was to study a set of well-observed events to understand why some events are successfully forecast (textbook cases), whereas others become problem or failed forecasts. For each event the columns in Table 1 describe the solar source regions, the effects or responses at Earth, and the resulting peak storm levels in Dst and Kp and the equivalent NOAA "G" level.

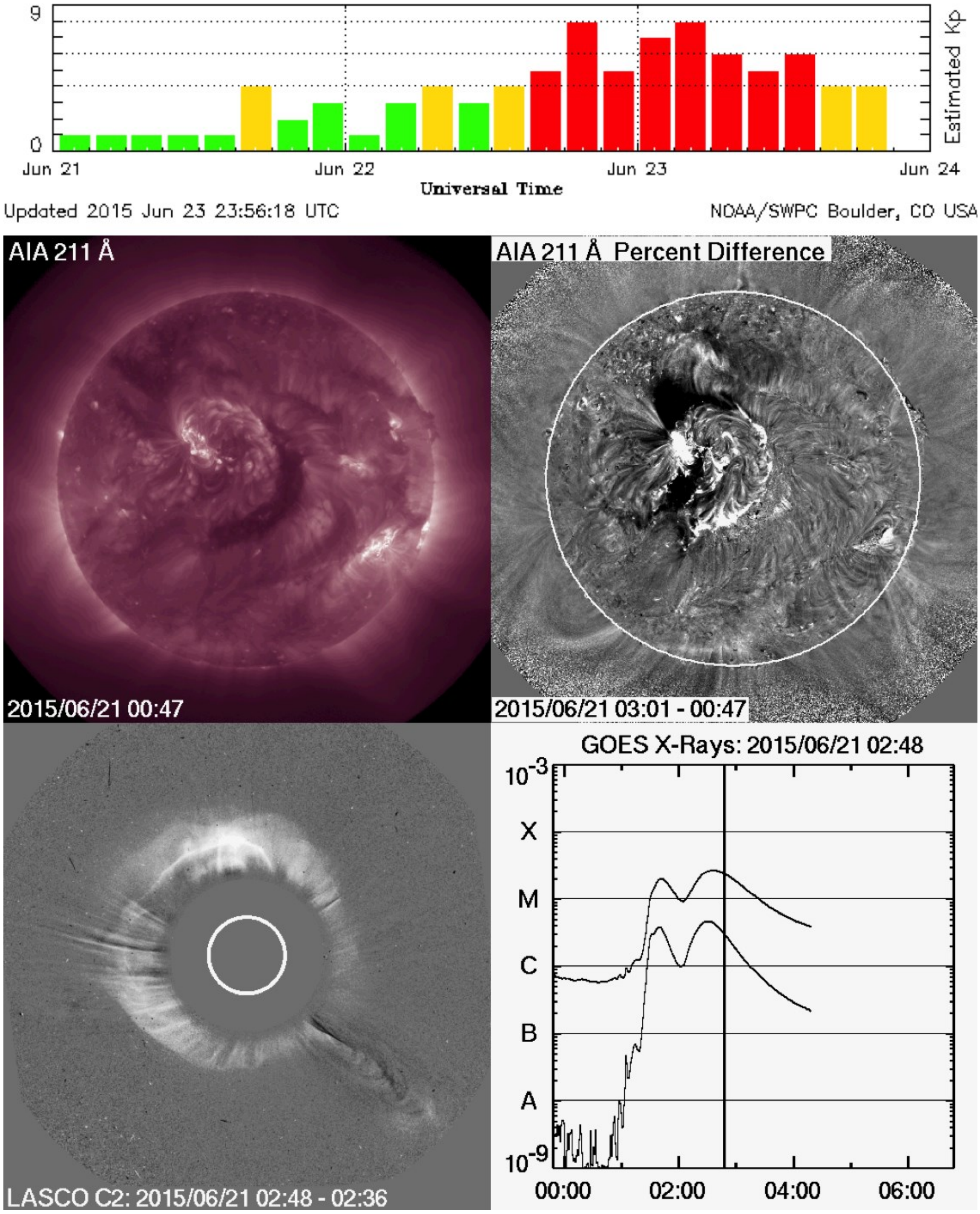


Figure 1. (Top) NOAA/SWPC plot of the Kp index for three days from 21-24 June 2015. The red bars indicate the storm levels with Kp > 4. (Bottom) Images showing the June 21 flare and dimming region in AIA 211Å (top panels), and the symmetric halo CME and GOES X-ray plot (bottom panels). This fast (1300 km/s) halo CME was associated with the M2.6 flare at N12°E13° peaking at 01:42 UT.

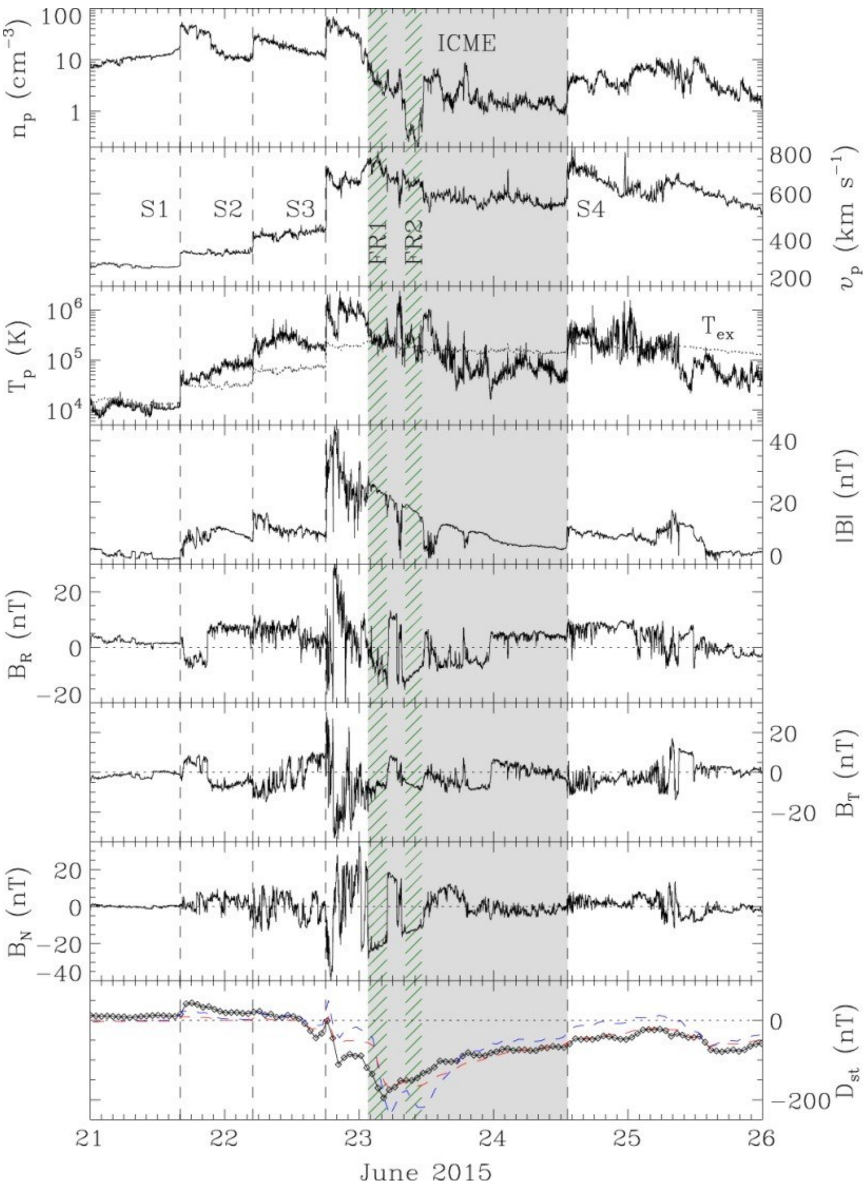


Figure 2. Solar wind measurements at Wind and associated Dst index for the 22-24 June 2015 event. The shaded region shows the overall ejecta interval, while the hatched areas indicate two small flux ropes identified within the ICME. Three shocks are observed ahead of the ejecta. The last shock (S4) was driven by the CME that occurred at the Sun on 22 June and was overtaking the ICME at 1 AU. From Liu et al. (ApJL, 809, L34, 2015).

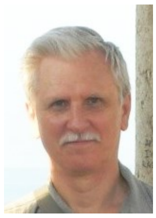
How successful the forecasts were is noted in the last column of Table 1. The July 2012 and June 2015 cases were initially considered textbook cases but the forecasts were not fully accurate. The June 2015 case involved a compound event that likely pushed the storm level to severe. The next three cases were all considered problem events that we now understand: March 2015 - two CMEs possibly interacted near the Sun and were deflected by a CIR; September 2014 - the storm was very over-predicted because the shock sheath and magnetic cloud fields were almost entirely northward (+Bz); October 2012 - a CME was identified but the surface signatures were weak and confusing, leading to uncertainties in the arrival time. The May-June 2013 case was a problem event which we still do not fully understand. No storm was forecast but a brief, strong storm occurred. The 21-24 June 2015 case (see figures) was a compound event. The NOAA forecast of a severe storm was accurate but delayed. The storm was mainly caused by the ICME with its magnetic cloud that followed shock S3, but the severity was enhanced by other shocks and sheaths plus fast solar wind that compressed the solar wind structures.

Reference

Webb, D. and N. Nitta (2017), Study on understanding problem forecasts of ISEST campaign flare-CME events, Solar Phys., Under Review.

Article 3:

Catalog of large-scale solar wind phenomena during 1976–2016



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Information on the large-scale solar wind phenomena is very important for study of the Sun, heliosphere and the solar-terrestrial links. During the period of 2002 - 2007 on the basis of OMNI database of 1-h solar wind (SW) plasma and IMF parameters we have made the `Catalog of large-scale solar wind phenomena during

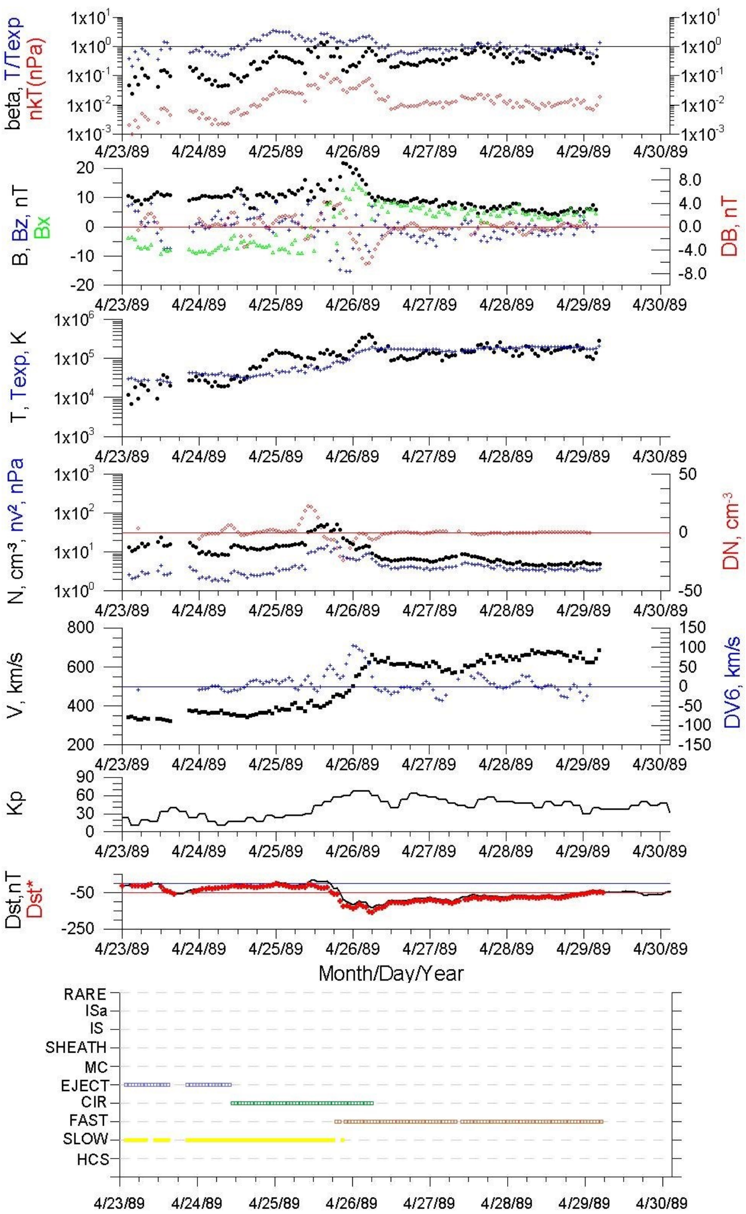

Figure 1. Example of OMNI and calculated data of solar wind plasma and field parameters and magnetospheric indices (7 upper panels) and identification of solar wind phenomena (bottom panel).

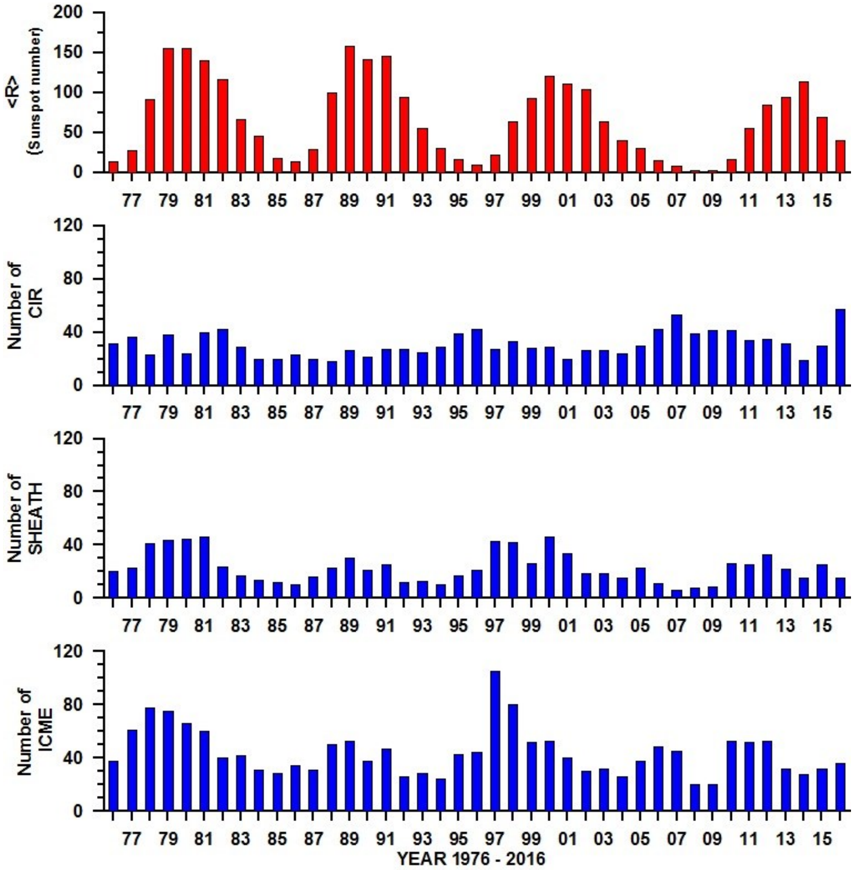

Figure 2. Yearly numbers of sunspot and different types of solar wind phenomena for interval of 1976-2016.

1976–2000` (see website ftp://ftp.iki.rssi.ru/pub/omni/ and paper [Yermolaev et al., 2009; http://www.iki.rssi.ru/people/y_etalcr2009.pdf]) which identifies reliably 3 types of quasi-stationary streams of the solar wind (heliospheric current sheet (HCS), high speed streams from the coronal holes (HSS), and slow streams from the coronal streamers), and 5 disturbed types (compression regions before fast streams HSS (CIR), and interplanetary manifestations of coronal mass ejections (ICME) that can include magnetic clouds (MC) and Ejecta with the compression region Sheath (SHEMC and SHEEj) preceding them) as well as the interplanetary shock (IS). Under VarSITI support we added information for period of 2001-2016.

The work included (1) adaptation of program complex, which was initially made for OMNI data, for operation with OMNI2 data, (2) calculation of additional parameters and visualization of them (see upper panels of Figure 1) and (3) machine and visual identification of SW types and visualization of them (bottom panel of Figure 1). Yearly numbers of sunspot and CIR, SHEATH and ICME for interval of 1976-2016 are shown in Figure 2.

The obtained data are the convenient tool for the solution of tasks of the VarSITI program (in particular, ISEST/MiniMax24 project): researches of mechanisms of propagation of solar transients through the space, transfer of disturbances from the Sun to the Earth and prediction of geomagnetic disturbances.

This work was supported by a grant from SCOSTEP/VarSITI.

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Article 4:

Database on the Forbush-effects and interplanetary disturbances to study Earth-affecting solar transients

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The database for Forbush effects and interplanetary disturbances started to be created in IZMIRAN in the 90th years, and since that time it was continuously improved and expanded. Now it comprises data on the solar, interplanetary, geomagnetic disturbances, on the disturbances observed in cosmic rays (CR), and covers more than semi centennial period (from 1957 to 2016) of observation. Uniqueness of this local database is that in addition to different parameters characterizing disturbances from different sides (solar, interplanetary and geomagnetic data) it also contains the data on density and anisotropy of CR of 10 GV rigidity received by method of global survey (GSM) by the data of a world network of neutron monitors. Used GSM version was also developed in IZMIRAN. It considers all world neutron monitor network as one multidirectional device and allows receiving characteristics of the CR (density, anisotropy and its components, various rigidity spectra) outside the atmosphere and a magnetosphere of Earth. Hourly average count rates of neutron monitors (NM) for computation of the CR parameters are undertaken as directly from some stations, so from NMDB database (www.nmdb.eu), founded under the European Union's FP7 program (contract no. 213007) for providing data.

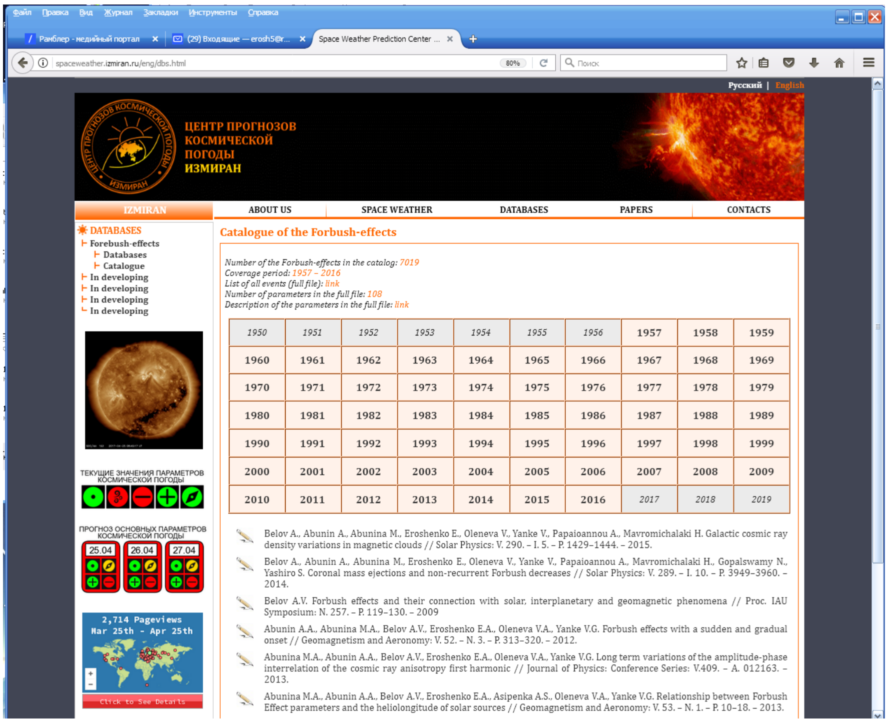

Figure 1. Screenshot of the page for Database on the Forbush effects and interplanetary disturbances in http://spaceweather.izmiran.ru/eng/dbs.html.

The results of GSM are included then in our database. But, as this database is local, it served only for internal use so far. Many inquiries concerning information which is saved up in this base pushed our research team to update this informational resource and to plan a creation the Internet version of this database long ago, but only this year it became possible.

In the frame of VarSITI grant we worked on the transfer this database into the Internet, and at present, the database on the Forbush effects and interplanetary disturbances (FEID) exists in open access by the address http://spaceweather.izmiran.ru/eng/dbs.html (Fig.1). It contains all the events over the period 1957 to 2016 (>7000 events) with complete set of the parameters which exist in the offline database (> 100 parameters in total for each event).

Inclusion of data for the long-lived periods (several solar cycles) allows the estimation of variations and interrelation of many parameters of the interplanetary environment (a solar wind, cosmic rays, indexes of solar and geomagnetic activity) within Solar Activity cycles. It gives the chance to trace how the quantity and size of FD changed in the last solar cycles.

Below some results obtained from FEID database for the last six solar cycles are presented.

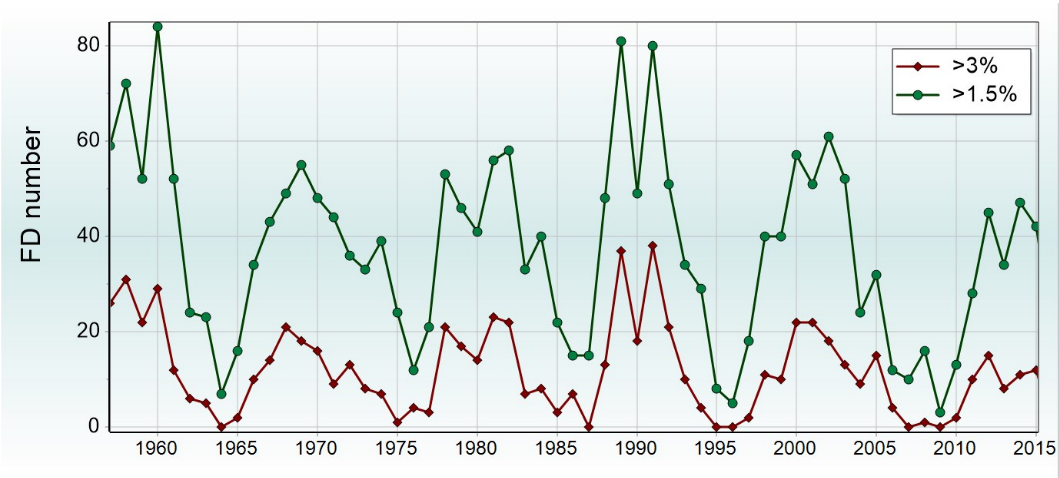

Figure 2. Number of FEs with the size >1.5% and > 3% for every year during 1958-2015.

Fig. 2 shows that the number of FDs in the last minimum of solar activity (2006-2010) fell below, than in other minima and this decrease kept longer.

The number of FDs in the last period of high solar activity (2012-2015) is apparently lower, than during the same periods of 19-23 cycles.

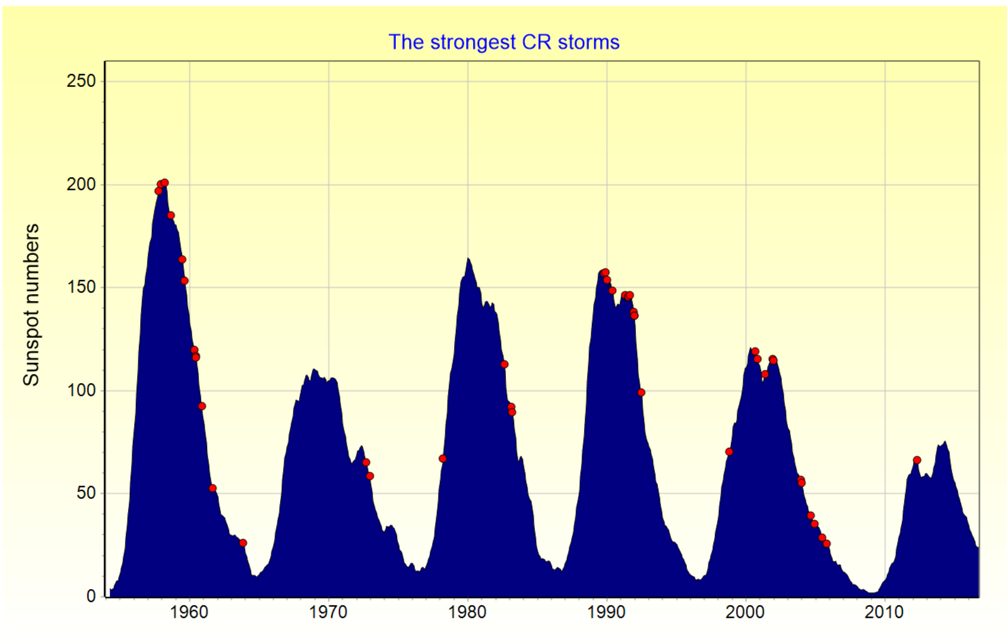

Figure 3. Changes of the solar sunspot number and the moments of giant FDs (> 12%) in 1957-2016.

In Fig. 3 on the background of changes of sunspot number the moments of the most largest FDs are shown (with magnitude > 12% for a rigidity 10 GV). Such large FDs is a rarity – during all the time since 1957 only 22 of them were observed. From these events only 1 (in March, 2012) occurred in the current 24th cycle. And this FD in size (13.1%) gives way to the most larger FD of the previous 19-23 cycles which had the size of 19.3%, 25.3%, 22.8%, 23.4%, and 29.7%, respectively

The simplest way to combine FD number and size is summarising of the Forbush-decrease magnitudes for the particular period, for example during the month (Fig.4).

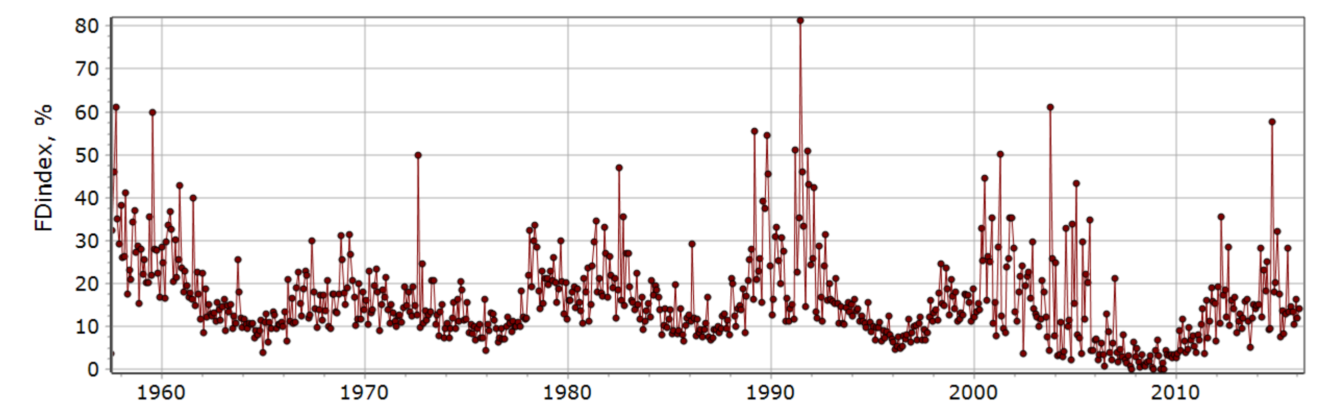

Figure 4. Monthly FD-index in 1957-2016 .

It is possible to see how FD-index changes together with a cycle of solar activity – it is much more in SA maxima and less – in minima. In all minima of the 20th century the FD-index is about 10%. On this background the last minimum between 23 and 24 solar cycles is sharply distinguished. During this period FD-index decreased to size not observed earlier (<4%), in separate months 2009 it fell almost to 0.

In a phase of a maximum and descent of solar activity larger changes of variations of CR are observed. Often very big differences of FD-index are visible between the next months. Some months are distinguished with its activity, especially active was June, 1991. At this time there were no CME observations, and data on a solar wind are sketchy and not reliable, but cosmic rays unambiguously testify on many powerful ICMEs in June, 1991

In a maximum of the last 24th solar cycle the highest Forbush-activity was observed in March, 2012. In general, FD activity in the 24th cycle is comparable with activity of the 20th cycle and obviously concedes to all other cycles.

The Internet version of our FEID database is permanently extended and upgraded, and in the nearest time the possibility will be realized for a selection and sorting the events by any parameters.

Highlight on Young Scientists 1:

On the investigation of source location of Very Low Latitude (L=1.08) Whistlers

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The Very Low Frequency (VLF) remote sensing comes to rescue when the ionospheric regions can't be accessible either through balloons or satellites. Whistlers observed from mid ($2 \leq L \leq 5$) and high latitudes ($L \geq 5$) have been extensively used as a powerful tool to diagnose Earth's magnetosphere [1]. Unfortunately, low latitude whistlers ($L \leq 2$) have not been exploited for determining the ionospheric parameters due to its uncertainty of propagation mechanism. The identification of lightning discharges that generate whistlers answers the fundamental question on propagation path of low-latitude whistlers [2] and explores the possibility of using it to probe the ionosphere [3].

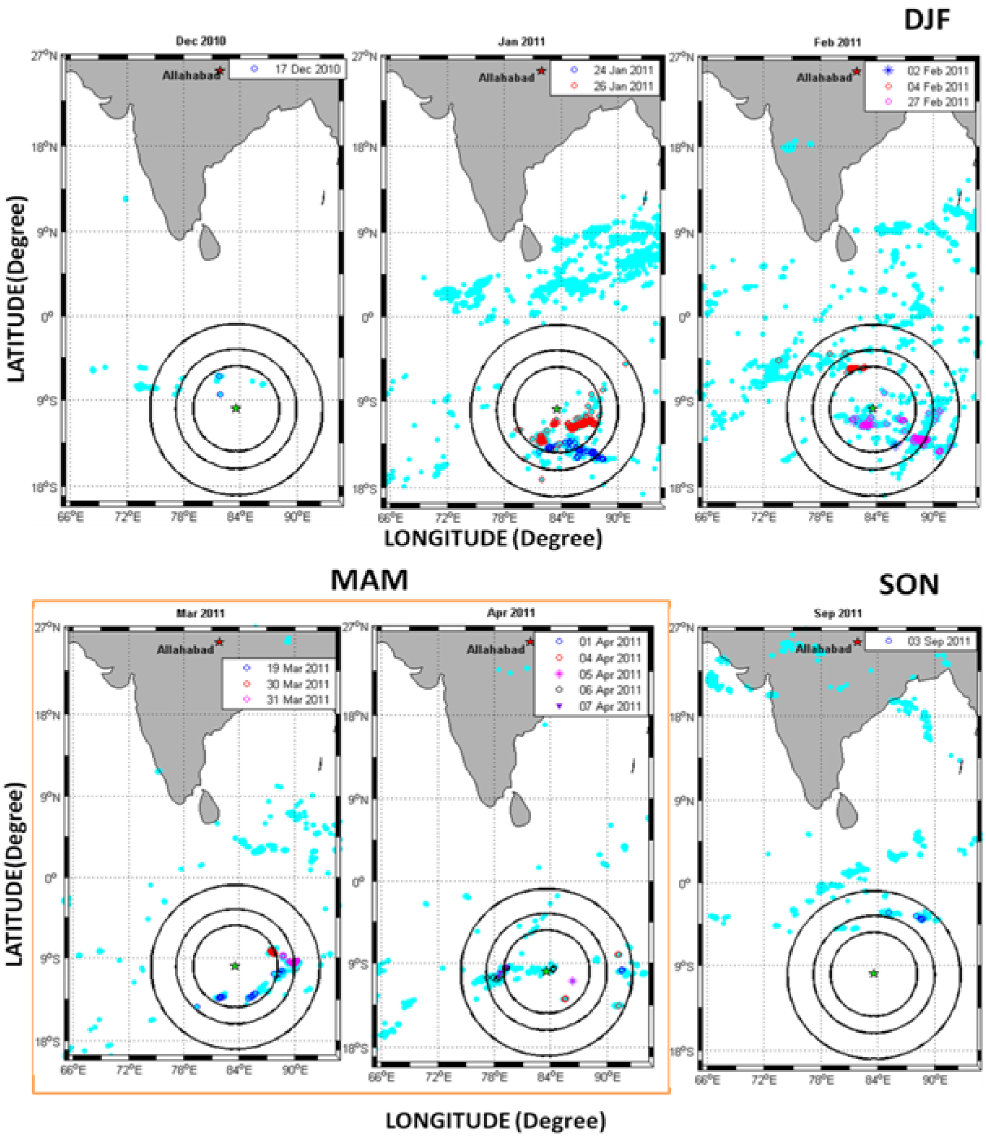

Figure 1. Maps showing lightning activity in the vicinity of conjugate region within circles of radii 500 km, 700 km, and 1000 km, with the conjugate point of Allahabad as the center, for different seasons. DJF (December, January and February), MAM (March, April and May) JJA (June, July and August) and SON (September, October and November).

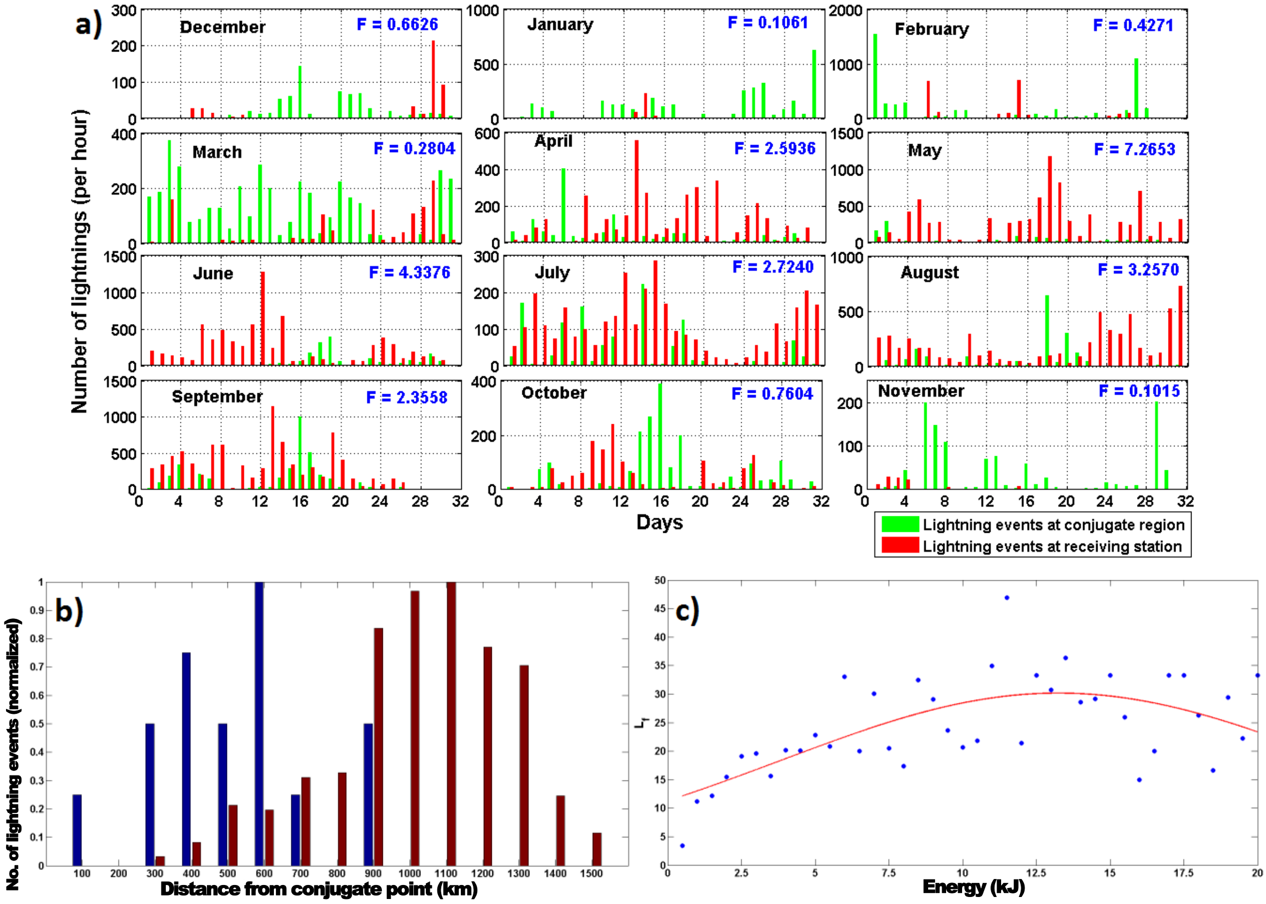

Figure 2. Number of lightning strokes per hour in the conjugate region and at the receiving station occurred during 19:00–24:00 UT with spatial extent of 1000 km. F is the ratio of hourly lightning rate within 1000 km of the receiving station to that within 1000 km of the conjugate region. b) Number of lightning discharges that produced whistlers (blue bars) and total number of lightning discharges (red bars) during 2011. c) Distribution of fraction of lightning discharges that produced whistlers in different energy bands.

We carried out thorough analysis of source lightning discharges of whistlers observed at Indian low latitude station, Allahabad (Geomag.lat. 16.79° N) to establish that whistlers have origin in low latitude and propagate through ionosphere [2, 3, 4]. By adapting one to one correlation analysis [3], we successfully found the source region of the observed whistlers in the vicinity of the conjugate point with radial extent of 1000 km (Fig. 1). It is indispensable to examine characteristics of lightning discharges since not all of them contribute towards whistler generation. No lightning at receiving station, thunderstorm alignment, its distance from the conjugate point, lightning threshold energy and type are necessary conditions to have low latitude whistler propagation (Fig. 2). From detailed investigation of source location and whistler-lightning characteristics, we established that the path of observed whistlers is embedded in the top side ionosphere [4]. And hence, low latitude whistlers, as a tool, have potency to explore topside ionosphere.

References

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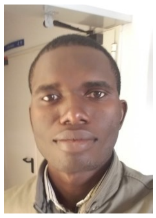
[4] Sneha A Gokani, Rajesh Singh, Morris B Cohen, Sushil Kumar, K Venkatesham, Ajeet K Maurya, R Selvakumaran, and J Lichtenberger. Very low latitude (l= 1.08) whistlers and correlation with lightning activity. Journal of Geophysical Research: Space Physics, 120(8):6694–6706, 2015.

Highlight on Young Scientists 2:

Signatures of interhemispheric field-aligned currents in the African sector



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The interhemispheric field-aligned currents (IHFACs) exist every time there is a difference in the electric potential between the conjugate of two ionospheres. These currents play a significant role in space plasmas. Hence, it is expedient to know their intensity and morphology. This will help to improve our space weather forecasts of the magnetosphere-ionosphere interactions and their potential impositions on low – orbiting spacecraft.

Although, the IHFACs have been observed many times, yet very little attention has been given to their possible effects in the African sector – a region with the largest ground footprint of the continent along the geomagnetic equator. This region has a special advantage of being free from the violent and rapid changes that are noticeable in other regions of the globe. As a consequence, the ionosphere in this region is very sensitive to any change

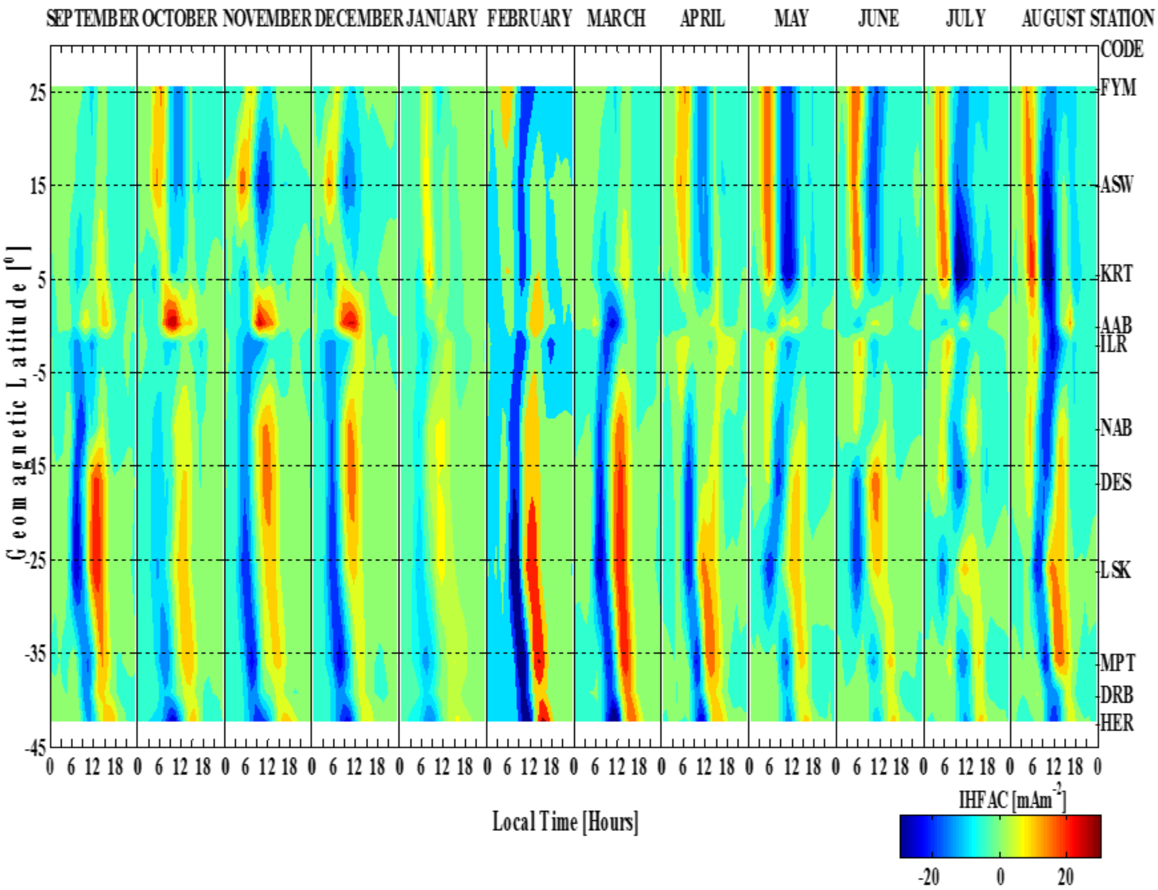

Figure 1. Local time versus latitudinal distribution of the monthly interhemispheric field –aligned currents in the African sector. Positive values indicate that the IHFACs are flowing northward.

Highlight on Young Scientists

in the electric potential between the northern and southern hemispheres.

Seeking to unravel the IHFACs features in Africa, we analyse the variability of IHFACs during the period of deep minimum (Figure 1). Our results indicates that the IHFACs pattern in the African chain show a persistent reversal in the north – south asymmetry, such that, the ionospheric horizontal solar quiet (Sq) current imbalance is stronger in the northern hemisphere than the southern hemisphere, except during the dusk.

References:

Lühr, H., Kervalishvili, G., Michaelis, I., Rauberg, J., Ritter, P., Park, J., Merayo, J. M. G., Brauer, P. (2015), The interhemispheric and F region dynamo currents revisited with the Swarm constellation, Geophysical Research Letters, 42, 9, p. 3069-3075, doi: http://doi.org/10.1002/2015GL063662.

Bolaji, O.S., A.B. Rabiu, E. O. Oyeyemi, and K. Yumoto (2012), Climatology of the interhemispheric field-aligned currents over the Nigerian ionosphere, J. Atmos. Terr. Phys., 89, 144 – 153, doi: http://dx.doi.org/10.1016/j.jastp.2012.07.008.

Project SPeCIMEN

Highlight on Young Scientists 3:

Magnetospheric and ionospheric properties of ELF/VLF emissions using combined ground-space measurements

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Claudia Martinez-Calderon

Extremely Low and Very Low Frequency (ELF/VLF) waves are electromagnetic whistler-mode plasma waves that can cause loss or acceleration of high energy electrons. Continuous measurements using VLF antennas at Athabasca, Canada (54.7°N, 246.7°E, L=4.3) allowed us to study the physical characteristics of these waves at subauroral latitudes. We considered their occurrence under different geomagnetic conditions and studied the point at which they exit the ionosphere [1,2]. More recently, we combined our ground-based measurements with conjugate and simultaneous wave observations made by the Van Allen Probes (RBSP). We obtained valuable information on the importance of cold plasma density in wave propagation and how magnetospheric compression affects wave generation [3, 4].

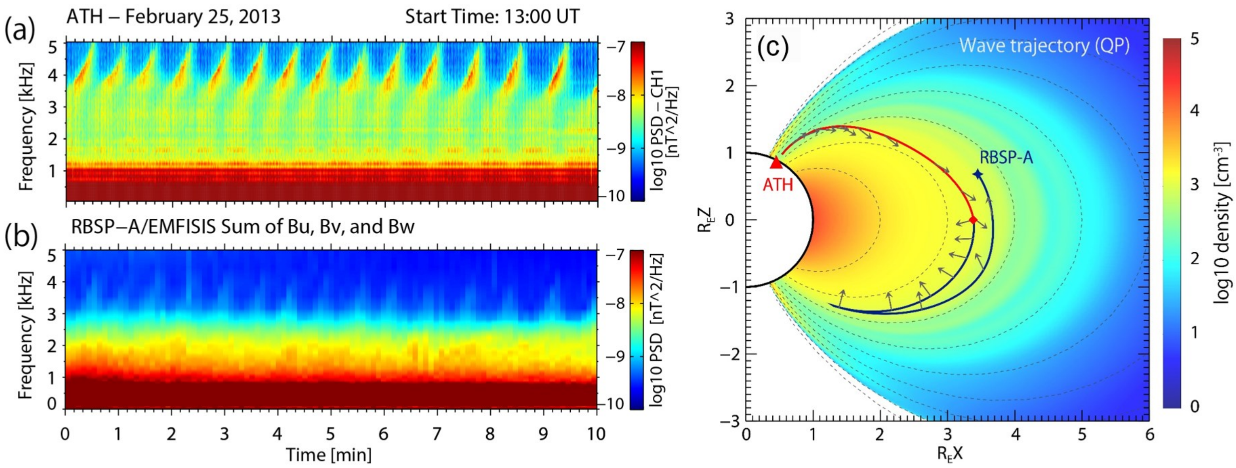

Figure 1. Adapted from Martinez-Calderon et al., 2016b. 10-minute example of power spectral density for a conjugate quasi-periodical emission showing the same spectral features in the ground at (a) Athabasca and in space by (b) RBSP-A (survey mode). (c) Ray tracing results showing the best solution for the ray path that the waves followed during the conjugate event.

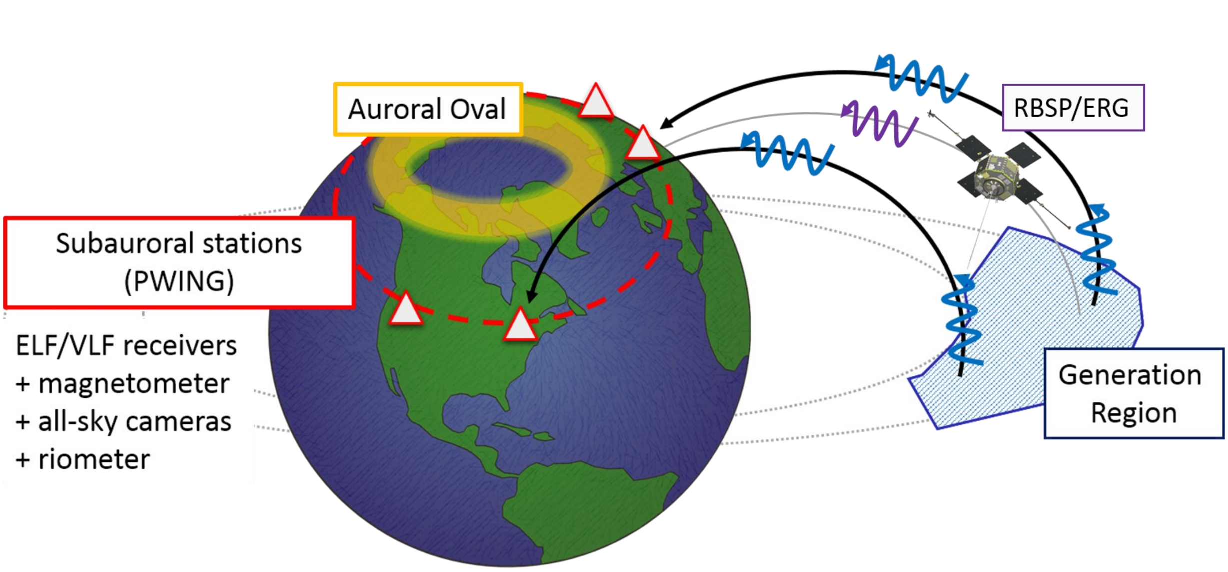

Figure 2. Illustration of conjugate ELF/VLF events between the ground and satellites (RBSP/ERG) and between several ground-stations from the PWING project.

To expand my knowledge on wave-particle interactions, I spent a year at UCLA in Jacob Bortnik's group. I studied the long-term influence of lightning activity on the fluxes of trapped electrons using the WWLLN[1] network and RBSP.

Now, as a JSPS post-doctoral fellow in Yuto Katoh's group in Tohoku University, my ongoing work is to study the effects of background plasma parameters on wave generation and propagation. We are currently working with simultaneous observations of ELF/VLF emissions between ground stations (PWING[2] project, Sodankylä Geophysical Observatory) and satellites in the inner magnetosphere (Arase/ERG and RBSP).

References:

[1] Martinez-Calderon C, Shiokawa K, Miyoshi Y, Ozaki M, Schofield I, Connors M (2015) Polarization analysis of VLF/ELF waves observed at subauroral latitudes during the VLF-CHAIN campaign. Earth Planets Space 67:21. doi:10.1186/s40623-014-0178-7.

[2] Martinez-Calderon, C., K. Shiokawa, Y. Miyoshi, M. Ozaki, I. Schofield, and M. Connors (2015), Statistical study of ELF/VLF emissions at subauroral latitudes in Athabasca, Canada, J. Geophys. Res. Space Physics, 120, 8455–8469, doi:10.1002/2015JA021347.

[3] Martinez-Calderon, C., et al. (2016), ELF/VLF wave propagation at subauroral latitudes: Conjugate observation between the ground and Van Allen Probes A, J. Geophys. Res. Space Physics, 121, 5384–5393, doi:10.1002/2015JA022264.

[4] Martinez-Calderon, C., et al. (2017), Simultaneous ground-satellite ELF/VLF emissions generated by strong magnetospheric compression, J. Geophys. Res. Space Physics, Under Review.

Notes:

[1] World Wide Lightning Location Network, http://wwlln.net/new/.

[2] Study of dynamical variation of particles and waves in the inner magnetosphere using ground-based network observations, http://www.isee.nagoya-u.ac.jp/dimr/PWING/en/.

Meeting Report 1:

ROMIC workshop

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Figure 1. Participants of ROSMIC workshop.

A total of 18 projects at 15 institutes are funded within the German research program ROMIC (Role Of the Middle atmosphere In Climate) which is supported by the German Federal Ministry of Education and Research (BMBF). Most of the projects will be terminated by the end of 2017. Therefore, a last workshop took place on 11/12 May 2017 at the Leibniz Institute of Atmospheric Physics (IAP) in Kühlungsborn. A total of approximately 70 scientists and students participated in the meeting and reported about recent progress being made in their projects. This concerns various science topics such as the variation of solar spectral irradiance and its impact on the middle atmosphere, long term variability and trends of temperatures, dynamics, mesospheric ice clouds, hydroxyl emissions, and stratospheric aerosols. A separate young scientists meeting was organized prior to the ROMIC workshop. More information about ROMIC including science objectives and results can be found on the ROMIC webpage at https://romic.iap-kborn.de/index.php?id=9.

A concept regarding a second phase of ROMIC was developed and submitted to the BMBF in late 2016. During the workshop at IAP representatives of the BMBF announced that they are considering to launch a second phase of ROMIC and will hopefully be able to publish a respective program call later this year. This would ensure a strong German contribution to the next SCOSTEP program for several years to come.

Upcoming meetings related to VarSITI

Conference	Date	Location	Contact Information
Advanced Concepts in Solar-Terrestrial Coupling in the Context of Space Weather - A Concepts and Tools School for Students (during the 2nd VarSITI General Symposium)	Jul. 9-14, 2017	Irkutsk, Russia	http://en.iszf.irk.ru/Space_weather_summer_school_2017
2nd VarSITI General Symposium	Jul. 10-15, 2017	Irkutsk, Russia	http://varsiti2017.iszf.irk.ru
IAU Symposium 335 "Space Weather of the Heliosphere: Processes and Forecasts"	Jul. 17-21, 2017	Devon, UK	http://www.exeter.ac.uk/iaus335
AOGS 14th Annual Meeting	Aug. 6-11, 2017	Singapore	http://www.asiaoceania.org
URSI General Assembly and Scientific Symposium	Aug. 19-26, 2017	Montreal, Canada	http://www.ursi2017.org
IAPSO-IAMAS-IAGA Joint Assembly	Aug. 27-Sep. 1,2017	Cape Town, South Africa	http://www.iapso-jamas-iaga2017.com
2nd International School on Equatorial and Low-Latitude Ionosphere (ISELLI-2)	Sep. 11-15, 2017	Lagos, Nigeria	http://carnasrda.com/iselli-2/
13th International Workshop on Layered Phenomena in the Mesopause Region (LPMR)	Sep. 18-22, 2017	Kühlungsborn, Germany	https://www.iap-kborn.de/1/current-issues/events/lpmr/
International Study of Earth-affecting Solar Transients (ISEST/MiniMax24) Workshop in 2017	Sep. 18-22, 2017	Jeju Island, Korea	http://kswrc.kasi.re.kr/Workshop/isest2017/
14th European Space Weather Week	Nov. 27-Dec. 1, 2017	Ostend, Belgium	http://www.stce.be/esww14/
The International School on Equatorial and Low Latitude Ionosphere (ISELION 2018)	Mar. 5-9, 2018	Sumedang, Indonesia	
VLF/ELF Remote Sensing of Ionospheres and Magnetosphere (VERSIM) 8th Workshop	Mar. 19-23, 2018	Apatity, Kola Peninsula, Russia	
SCOSTEP 14th Quadrennial Solar-Terrestrial Physics Symposium	Jul. 9-13, 2018	Vancouver, Canada	http://www.yorku.ca/scostep/

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.
   With the writer's approval, the small face photo will be also added.
   On workshop/conference/ symposium report related to VarSITI
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_isee.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_isee.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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