VarSITI – Variability of the Sun and Its Terrestrial Impacts

VarSITI

the SOSTEP’s scientific program

2014-2018
Solar Variability and SCOSTEP Scientific Programs

International sunspot number $R_i$: monthly mean and 13-month smoothed number

- Dawn of Space Age
- IGY (1960)
- IQSY (1970)
- 1980
- 1990
- 2000
- IHY (2010)

- SMY
- MAP
- STEP
- SRAMP
- PMOS
- EPIC
- ISCS
- CAWSES
- VarSITI

Nat Gopalswamy UNCOPUOS2015
SILSO graphics (http://sidc.be) Royal Observatory of Belgium 2015 February 1
VarSITI organization

- VarSITI-related scientists (signed in to the VarSITI mailing list) are **almost 1000**
- From 68 countries
- Some (Russia, Japan, India, USA, Nigeria, China) – with more than 80 each
- Others (Azerbaijan, Bosnia and Herzegovina, Congo, Cuba, Georgia, Ghana, Mauritius, Sri Lanka, Sudan, Tanzania, Zambia) – with just 1 participant, but still participating
VarSITI has 4 scientific projects

**International Study of Earth-Affecting Solar Transients (ISEST)/MiniMax24**

How do coronal mass ejections (CMEs) and corotating interaction regions (CIRs) propagate and evolve, drive shocks and accelerate energetic particles in the heliosphere?

**Solar Evolution and Extrema (SEE)**

1) Are we at the verge of a new grand minimum? If not, what is the expectation for cycle 25?
2) Does our current best understanding of the evolution of solar irradiance and mass loss resolve the "Faint Young Sun" problem? What are the alternative solutions?
3) What is the largest solar eruption flare possible? What is the expectation for periods with absence of activity?

**Role Of the Sun and the Middle atmosphere/thermosphere/ionosphere In Climate (ROSMIC)**

1) What is impact of solar forcing of the entire atmosphere? What is the relative importance of solar irradiance versus energetic particles?
2) How is the solar signal transferred from the thermosphere to the troposphere?
3) How does coupling within the terrestrial atmosphere function (e.g., gravity waves and turbulence).
4) What is the impact of anthropogenic activities on the Middle Atmosphere, Lower Thermosphere, Ionosphere (MALT)?
5) What are the characteristics of reconstructions and predictions of TSI and SSI?
6) What are the implications of trends in the ionosphere/thermosphere for technical systems such as satellites.

**Specification and Prediction of the Coupled Inner-Magnetospheric Environment (SPeCIMEN)**

Can the state of the Earth’s inner magnetosphere be specified and predicted to high accuracy, based on inputs from the Sun and solar wind?
VarSITI runs these projects by:

- Organizing coordinated investigations (campaigns)
- Supporting the creation and distribution of databases of solar-terrestrial data
- Organizing and supporting topical meetings and sessions in general meetings
SPeCIMEN: Coordinated investigations of topside H+ ions: new results for inner magnetosphere

Motivation: During the last deep min much higher neutral H than models predict ⇒ much lower O+/H+ transition height ⇒ increased plasmaspheric H+ fluxes ⇒ enhanced nighttime mid-lat NmF2 ⇒ implications for plasmasphere refilling after magnetic storms

Objective: observations during the approaching the next min after a very weak cycle

2 Periods: March 21÷24 and June 6-10, 2017

Krarkiv incoherent scatter radar

Meeting to summarize the results: 06-10 October 2017, Prague
ISEST Ongoing campaign through the whole duration of VarSITI

Daily email from MiniMax24

1. Non-flare Target – selected by the MiniMax24 campaign team (large coronal holes close to central meridian, large filaments within +/- 30° of central meridian likely to erupt)
2. Information on current flare activity (MaxMillenium)
3. We encourage the community to initiate joint event studies*

*ISEST wiki platform
http://solar.gmu.edu/heliophysics/index.php/The_ISEST_Event_List
ISEST Ongoing campaign through the whole duration of VarSITI

Diversity of VarSITI

- The MiniMax24 email list reaches more than 500 participants from more than 60 countries.

- Huge platform of experts in different fields of solar and heliospheric physics – we communicate daily!

- Emails are sent by a team of about 7 persons (UNI Graz, Kanzelhöhe Observatory, UNI Zagreb)
Databases

• **principal objectives**
  • to stimulate *interaction* among data providers, data scientists, and data-oriented researchers of the SCOSTEP community
  • long-term *preservation* and *provision* of quality-assessed data and information
  • development of *advanced data systems* to enable scientists to perform multidisciplinary data-analysis

• **A collection of solar-terrestrial databases** provided freely available online from VarSITI’s web-site

• **Development of new databases**
A collection of solar-terrestrial databases at VarSITI’s web site

Variability of the Sun and Its Terrestrial Impact (VarSITI) 2014-2018
SEE / ISEST-MiniMax24 / SPeCIMEN / ROSMIC

VarSITI-Related Database Resources
Discussed at SCOSTEP-WDS Workshop on Sept. 28-30, 2015
Last modified 11/23/2017 13:04:54

The list below has 134 different Databases
Print 📄 (15 pages) or download as Excel file 🔄 (118 KB)

<table>
<thead>
<tr>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. database-comprehensive (7)</td>
</tr>
<tr>
<td>3. database-multi (10)</td>
</tr>
<tr>
<td>5. model and ground-based observation (1)</td>
</tr>
<tr>
<td>7. model (2)</td>
</tr>
<tr>
<td>9. satellite observation (future) (3)</td>
</tr>
</tbody>
</table>
## Development of new databases supported by VarSITI – 5 in 2017

### VarSITI Grants

**Creation of databases supported by VarSITI in 2017**

### Databases

<table>
<thead>
<tr>
<th>Database</th>
<th>Topic</th>
<th>Developer</th>
<th>Report Date</th>
<th>Look at</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Database for Assessment of Radiation Doses in the Earth's Atmosphere, Related to GLE events</strong></td>
<td>Ground Levels Enhancement (GLE) events, ISEST/Minimax24</td>
<td>University of Oulu, Finland</td>
<td>(Nov 22, 2017)</td>
<td></td>
</tr>
<tr>
<td><strong>Database for atmospheric and whistler events detected in the Russian Far East</strong></td>
<td>VLF whistlers and atmospherics, SPECIMEN</td>
<td>IKIR, FEB RAS, Russia</td>
<td>(Dec 14, 2017)</td>
<td></td>
</tr>
<tr>
<td><strong>Database on the Forbush effects and interplanetary disturbances to study Solar-Terrestrial relationship</strong></td>
<td>Cosmic Ray, ISEST/Minimax24</td>
<td>IZMIRAN, Russia</td>
<td>(Apr 25, 2017)</td>
<td></td>
</tr>
<tr>
<td><strong>Database of Directivity Functions for neutron monitors</strong></td>
<td>Cosmic Ray, ISEST/Minimax24</td>
<td>Yerevan Physics Institute, Armenia</td>
<td>(Apr 25, 2017)</td>
<td></td>
</tr>
</tbody>
</table>
# Development of new databases supported by VarSITI 6 in 2018

## Virtual Laboratory for the comprehensive analysis of Forbush-Effects and Interplanetary Disturbances (ViLaFEID)

**Topic:** Forbush effect and interplanetary disturbances, ISEST/Minimax24  
**Developer:** IZMIRAN, Russia  
**Contact:** Eugenia Froshenko

## Solar energetic electrons and radio emission signatures

**Topic:** Solar energetic electrons and radio emission signatures, ISEST/Minimax24  
**Developer:** SRTI-BAS, Bulgaria and NRIAG, Egypt  
**Contact:** Rositsa Miteva

## Database of lidar signals at "Paratunka" station

**Topic:** Lidar signals from middle and upper atmosphere in 2007–2017, VarSITI  
**Developer:** IKIR FEB RAS, Paratunka, Russia  
**Contact:** A.S. Perezhogin

## "Ionosphere and Magnetic Data - Klyuchi" (IMD-K)

**Topic:** Ionosphere and Magnetic Data obtained at the Klyuchi station, SPECIMEN  
**Developer:** IPGG SB RAS, Novosibirsk, Russia  
**Contact:** Anastasiva Belinskaya

## Database of Interplanetary Small-scale Magnetic Flux Ropes

**Topic:** Interplanetary Small-scale Magnetic Flux Ropes, VarSITI  
**Developer:** Uni of Alabama in Huntsville, USA  
**Contact:** Qiang Hu

## Magnetic station "Baygazan" database

**Topic:** quartz variometer (since 2010) and induction magnetometer (since Nov 2014), SPECIMEN  
**Developer:** Gorno-Altaysk State Uni, Altay Rep, Russia  
**Contact:** Alexey Gvozdarev
9 VarSITI supported meetings in 2017

### Meetings (ordered by date)

**Data Analysis Workshop on** Coronal Mass Ejections and Solar Radio Bursts  
Coronal and Interplanetary Shocks: Data Analysis from SOHO, Wind, and e-CALLISTO Data  
*February 19±25, 2017, Mekelle University, Mekelle, Ethiopia*  
*Supported by VarSITI web-address*  
[Short Report here](#)

**40th annual Seminar on** Physics of the auroral phenomena  
*March 13±17, 2017, Apatity, Murmansk region, Russia*  
*Supported by VarSITI web-address*  
[Short Report here](#)

**Workshop on** The 10 years of operation of High resolution Neutron Monitor Database-NMDB  
*March 20±23, 2017, Athens, Greece*  
*Supported by VarSITI web-address*  
[Short Report here](#)

**ISSI Forum on** Consistency of the Solar Radius: outstanding unsolved points  
*First semester of 2017, Switzerland*  
*Supported by VarSITI web-address: none*

**The 2nd VarSITI Symposium**  
*July 10±15, 2017, Irkutsk, Russia*  
*Supported by VarSITI web-address*  
[Short Report here](#)

**IAU Symposium 335** Space Weather of the Heliosphere: Processes and Forecasts  
*July 17±21, 2017, Exeter, UK*  
*Supported by VarSITI web-address*  
[Short Report here](#)

**13th International Workshop on** Layered Phenomena at the Mesopause Region (LPMR)  
*Sep 18±22, 2017, Kühlungsborn, Germany*  
*Supported by VarSITI web-address*  
[Short Report here](#)

**ISEST/MiniMax24 Workshop on** International Study of Earth-affecting Solar Transients  
*Sep 18±22, 2017, Jeju Island, Korea*  
*Supported by VarSITI web-address*  
**AGU Chapman Conference** Particle Dynamics in the Earth’s Radiation Belts  
*Sep 25±29, 2017, Biarritz, France*  
**March 4±9, 2018 Cascais, Portugal**  
*Supported by VarSITI web-address*
The most important event in 2017

Second VarSITI General Symposium
10-15 July, Irkutsk, Russia

162 scientists from 26 countries

Summarized in: Special Issue of Journal of Atmospheric and Solar-Terrestrial Physics to be published in 2018/2019

9÷14 July, 2017, Irkutsk, Russia
# VarSITI supported meetings in 2018

## Meetings (ordered by date)

<table>
<thead>
<tr>
<th>Meeting Name</th>
<th>Title</th>
<th>Date</th>
<th>Location</th>
<th>Supporting Details</th>
<th>Web Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>13th conference</td>
<td>Plasma Physics in the Solar System</td>
<td>February 12-16, 2018 Moscow, Russia</td>
<td>Siem Reap, Angkor Wat, Cambodia</td>
<td>supported by VarSITI</td>
<td></td>
</tr>
<tr>
<td>Dynamic Sun: II</td>
<td>Solar Magnetism from Interior to the Corona</td>
<td>February 12-16, 2018 Siem Reap, Angkor Wat, Cambodia</td>
<td>supported by VarSITI</td>
<td>web-address</td>
<td></td>
</tr>
<tr>
<td>AGU Chapman Conference</td>
<td>Particle Dynamics in the Earth’s Radiation Belts</td>
<td>March 4-9, 2018 Cascais, Portugal</td>
<td>supported by VarSITI</td>
<td>web-address</td>
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</tr>
<tr>
<td>41st annual Seminar</td>
<td>Physics of the auroral phenomena</td>
<td>March 12-16, 2018, Apatity, Murmansk region, Russia</td>
<td>supported by VarSITI</td>
<td>web-address</td>
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</tr>
<tr>
<td>The 8th biennial VERSIM Workshop</td>
<td>VLF/ELF Remote Sensing of Ionospheres and Magnetosphere</td>
<td>March 19-23, 2018 Apatity, Murmansk region, Russia</td>
<td>supported by VarSITI</td>
<td>web-address</td>
<td></td>
</tr>
<tr>
<td>DKIST Critical Science Plan Workshop 5</td>
<td>Wave generation and propagation</td>
<td>April 9-11, 2018, Newcastle upon Thyne, UK</td>
<td>supported by VarSITI</td>
<td>web-address</td>
<td></td>
</tr>
<tr>
<td>4th ANGWIN workshop</td>
<td>Exploration of High-latitude Upper Atmosphere Wave Dynamics</td>
<td>April 24-26, 2018, São José dos Campos, Brazil</td>
<td>supported by VarSITI</td>
<td>web-address</td>
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</tr>
<tr>
<td>10th International Workshop</td>
<td>Long-Term Changes and Trends in the Atmosphere</td>
<td>May 14-19, 2018, Hefei, China</td>
<td>supported by VarSITI</td>
<td>web-address</td>
<td></td>
</tr>
</tbody>
</table>
**20 VarSITI supported meetings in 2018**

<table>
<thead>
<tr>
<th>Meeting</th>
<th>Date/Location</th>
<th>Supported by VarSITI</th>
<th>Web Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>6th International conference <strong>Atmosphere, ionosphere, safety</strong></td>
<td>June 03-09, 2018 Zelenogradsk, Russia</td>
<td></td>
<td>web-address</td>
</tr>
<tr>
<td>7th International <strong>HEPPA-SOLARIS Workshop</strong></td>
<td>June 11-15, 2018 Blacksburg, Virginia, US</td>
<td></td>
<td>web-address is missing</td>
</tr>
<tr>
<td>7th IAGA/ICMA/SCOSTEP workshop on <strong>Vertical Coupling in the Atmosphere-Ionosphere System</strong></td>
<td>July 2-6, 2018 Potsdam, Germany</td>
<td></td>
<td>web-address</td>
</tr>
<tr>
<td>7th Symposium of <strong>Brazilian Space Geophysics and Aeronomy Society (SBGEA)</strong></td>
<td>August 6-10, 2018 Santa Maria-RS, Brazil</td>
<td></td>
<td>web-address</td>
</tr>
<tr>
<td>45th European Meeting on <strong>Atmospheric Studies by Optical Methods</strong></td>
<td>August 27-31, 2018 Kiruna, Sweden</td>
<td></td>
<td>web-address is missing</td>
</tr>
<tr>
<td>Annual African Geophysical Society (AGS) Conference on <strong>Space Weather</strong></td>
<td>September 24-27, 2018 Cairo, Egypt</td>
<td></td>
<td>web-address</td>
</tr>
<tr>
<td><strong>ISEST 2018 Workshop</strong> <strong>XVIth Hvar Astrophysical Colloquium</strong></td>
<td>September 24-28, 2018 Hvar, Croatia</td>
<td></td>
<td>web-address</td>
</tr>
<tr>
<td><strong>15th International Symposium on Equatorial Aeronomy</strong></td>
<td>October 22-26, 2018 Ahmedabad, India</td>
<td></td>
<td>web-address</td>
</tr>
<tr>
<td><strong>Consistency of the Solar Radius: outstanding unsolved points</strong></td>
<td>without date, ISSI, Bern, Switzerland</td>
<td></td>
<td>Jean-Pierre Rozelot</td>
</tr>
<tr>
<td><strong>VarSITI SEE project meeting</strong></td>
<td>without date, without place</td>
<td></td>
<td>Dibyendu Nandi</td>
</tr>
</tbody>
</table>
For the total duration of VarSITI

• **64** topical **meetings** and sessions in general meetings

• Creation and distribution of **16 databases** of solar-terrestrial data

• Support for **3** capacity-building **schools**

• **1** observational **campaign** and **1 permanent campaign** ongoing through the whole VarSITI duration
VarSITI web-site

Variability of the Sun and Its Terrestrial Impact (VarSITI) 2014-2018
SEE / ISEST-MiniMax24 / SPEcIMEN / ROSMIC

Welcome to: Variability of the Sun and Its Terrestrial Impact (VarSITI)

© VarSITI 2018

Variability of the Sun and Its Terrestrial Impact

The VarSITI program is the next scientific program of SCOSTEP (2014-2018)

VarSITI was defined based on a community effort in the form of a forum organized by the International Space Science Institute (ISSI) in Bern during May 7-8, 2013. The VarSITI program will strive for international collaboration in data analysis, modeling, and theory to understand how the solar variability affects Earth.

The VarSITI program will have four scientific elements that address solar terrestrial problems keeping the current low solar activity as the common thread:

- SEE (Solar Evolution and Extrema),
- MiniMax24/ISEST (International Study of Earth-affecting Solar Transients),
- SPEcIMEN (Specification and Prediction of the Coupled Inner-Magnetospheric Environment),
- ROSMIC (Role Of the Sun and the Middle atmosphere/thermosphere/ionosphere In Climate).

14th Quadrennial Solar-Terrestrial Physics Symposium – the major SCOSTEP event in 2018

Abstract deadline: February 15, 2018

There are 16 days until the Deadline!
Visit http://www.scostepevents.ca/
Read more

Latest News:
20 January 2018 One more Invitation to 14th Quadrennial Solar-Terrestrial Physics Symposium
June 03-08, Honolulu, Hawaii Look at (new details)
08 January 2018 Look at VarSITI grants for the Announcement of the 14th Quadrennial Solar-Terrestrial Physics Symposium
03 January 2018 News about Long-Term Observations of the Atmosphere May 14-19, 2018, Hefer
29 December 2017 Please look at "Calls for News". Some deadlines are in early 2018
14 December 2017 Announcement of Post Course in Space&Atmospheric SCience to April 30, 2019 (Look at)
04 December 2017 Call for papers: Second General Symposium in JASTP (look at)
02 December 2017 Announcement of 2018 Awards (Look at) and AGU prize (Look at)
30 November 2017 Announcement of 2018 Scholarship (SVS) Applications deadline is Now
13 January 2014 Kick-off of the VarSITI outreach via Internet (see press release)
VarSITI web-site http://www.varsiti.org/

53 499 visits from October 1, 2013 to January 22, 2018

Geographical distribution of visits
Four days (January 19-22, 2018)
VarSITI newsletters

Publish:

✓ Articles
✓ Highlights of young scientists
✓ Short news
✓ Meeting schedule

16 issues so far

Editors

Kazuo Shiokawa
Katya Georgieva

Newsletter secretary
Mai Asakura
Publication activity in scientific journals

2 special issues in the Journal of Atmospheric and Solar-Terrestrial Physics:

• **First VarSITI General Symposium**
• **Solar Activity in the Following Decades**

Promotional access for all VarSITI-related Special Issues:

• Free for the authors
• 9 months free access
• The authors can then upload their papers in institutional and other sites (ADS, arXiv, ResearchGate)
Publication activity in scientific journals

A Topical Issue on “Earth-affecting Solar Transients” is being published in Solar Physics Journal

ISEST Topical Issue

- 31 articles published online so far
- Some still under review
- 6 articles rejected
A Topical Issue on “Earth-affecting Solar Transients” is being published in Solar Physics Journal
Edited by Jie Zhang, Xochitl Blanco-Cano, Nariaki Nitta, Nandita Srivastva

- 31 articles published online so far
- Some still under review
- 6 articles rejected
A great community effort for space weather studies