

The Scientific Committee on Solar Terrestrial Physics (SCOSTEP)

Nat Gopalswamy
President, SCOSTEP

“Strengthening international solar-terrestrial science for the benefit of society”

What is SCOSTEP?

- SCOSTEP was established by ICSU in January 1966 as the Inter-Union Commission on Solar-Terrestrial Physics (IUCSTP).
- In September 1978, the XVIIth ICSU General Assembly ratified SCOSTEP's current constitution and SCOSTEP became a Scientific Committee of ICSU (aka interdisciplinary body)
- SCOSTEP is charged with the long-term responsibility of promoting international interdisciplinary programs of finite duration in solar-terrestrial physics. Specifically,
 - to develop and sustain student interest in Sun-Earth connections
 - to promote efficient exchange of data and information between solar and terrestrial scientists in all countries
 - to seek projects and programs that cross over traditional boundaries of physical regions and focused scientific disciplines
- SCOSTEP is engaged in science, capacity building, and public outreach to achieve the above objectives in cooperation with COSPAR, IAGA, IAMAS, IAU, IUPAP, SCAR, URSI, and WDS

Executives

President

Vice President

Scientific Secretary

Scientific Union Reps:

COSPAR - Committee on Space Research

IAGA - International Association of Geomagnetism and Aeronomy
IAMAS - International Association of Meteorology and Atmospheric Sciences

IAU - International Astronomical Union

IUPAP - International Union of Pure and Applied Physics

SCAR - Scientific Committee on Antarctic Research

URSI - International Union of Radio Science

WDS - World Data System

Scientific discipline Reps

National Adherent Reps

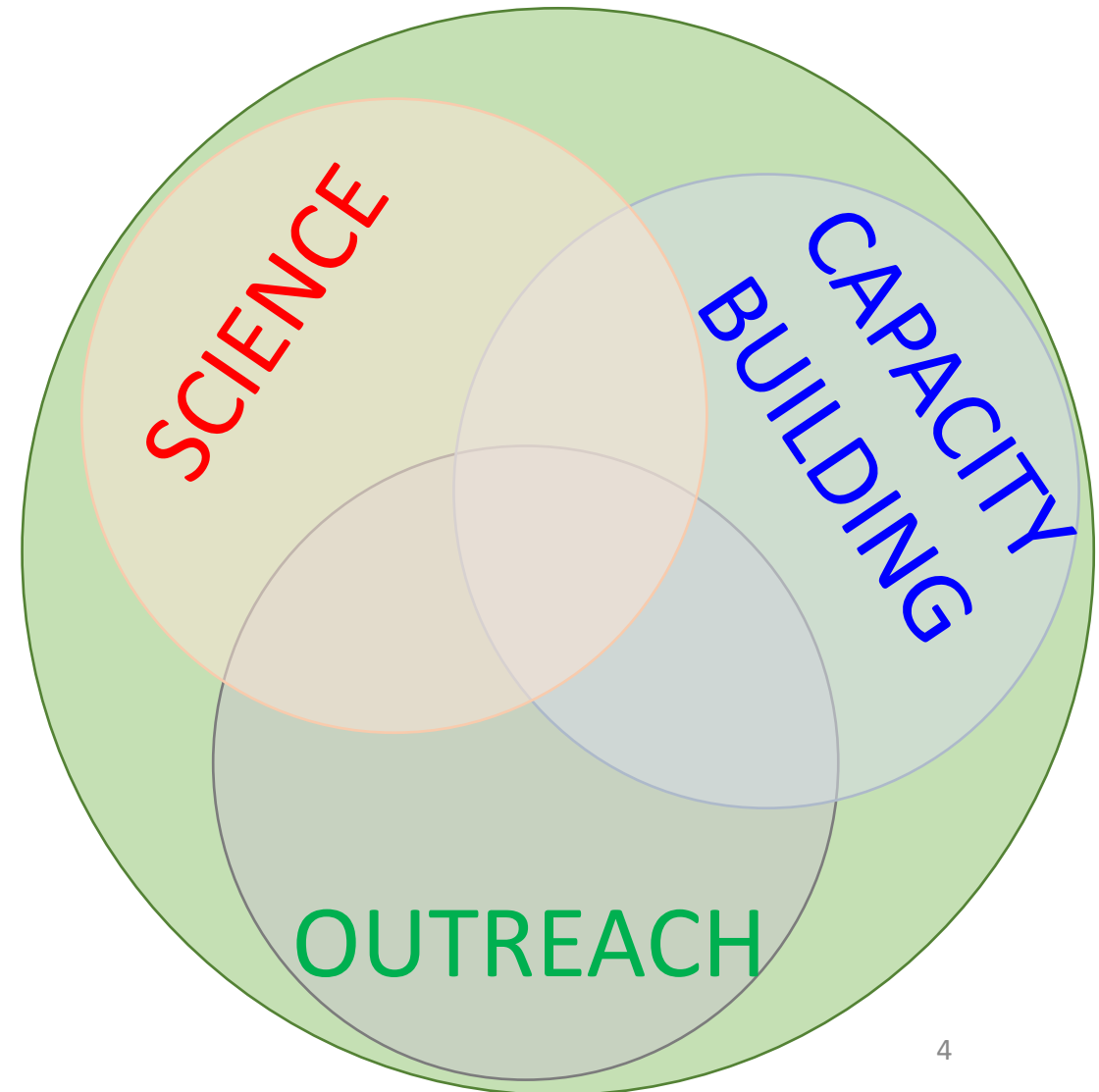
Committee chairs

SCOSTEP & ICSU (Now International Science Council - ISC)

- SCOSTEP is one of the 17 Interdisciplinary bodies of ICSU
- Other bodies with overlapping interests: interdisciplinary bodies (COSPAR, CODATA, SCAR, WDS) and scientific unions (IAGA/IUGG, IAMAS, IAU, IUPAP, URSI)
- SCOSTEP Bureau consists of representatives from all these scientific bodies (except CODATA), making it a truly interdisciplinary body
- SCOSTEP is the only organization running scientific research programs of broad interest and implications to life on Earth

What Does SCOSTEP do?

- Runs long-term international interdisciplinary scientific programs in solar terrestrial physics since 1966
- Interacts with national and international programs involving solar terrestrial physics activities
- Engages in Capacity Building activities such as the annual Space Science Schools and SCOSTEP Visiting Scholar Program, Workshops
- Outreach activities (comics books; public lectures; UN Committee on Peaceful Uses of Outer Space (UNCOPUOS))
- Disseminates new knowledge on the Sun-Earth System and how the Sun affects life and society
- Quarterly Newsletters
- Website: www.yorku.ca/scostep
- Symposia
- Quadrennial Solar Terrestrial Physics (STP) Symposia
- Scientific papers in refereed journals





Indonesia 2012
Kenya 2013
Peru 2014
India 2016
Azerbaijan 2018
Nepal
Portugal

School Report

Smt. Kasturbai Walchand College of Science & Arts, Rajnemi Campus,
Sangli, Maharashtra 416416, India

http://www.iap.res.in/meet/school_meet/index.php



International School on Space Science

- 28 lectures by 23 Professors from USA, Japan, India, and Norway on Sun-to-Earth topics
- ISWI Instruments workshop conducted by 8 scientists from USA, India, Japan, and Switzerland
- There were 120 applications. 74 students were selected. Participants were from China, Egypt, Ethiopia, India, Indonesia, Ivory Coast, Kenya, Korea, Nigeria, Philippines, Rwanda, Thailand, Uganda, and Vietnam
- The lecturers interacted with 100s of high school students

Full report available: <http://www.iswi-secretariat.org>



Decorative art by the local organizers using color powders (Rangoli)

Interactive Tutorial on Python – the free Software for Data Analysis



The school involved tutorials, lectures, hands-on activities, and instrument workshop

Capacity Building: One-day School



- Lectures by international experts that attended the VarSITI-2017 symposium
- Prepared students to absorb more of the symposium presentations
- Continued interaction between students and lecturers during the symposium
- Long-term collaboration

COSPAR Capacity Building Workshop on Shock Waves from the Sun **May 21 - June 1, 2018, Mekelle, Ethiopia**

- The main objective of the COSPAR Capacity-Building Workshops is to encourage the scientific use of space data by scientists in developing countries.
- The Mekelle workshop involved analysis of data from SOHO, STEREO, ACE, and Wind missions in conjunction with ground based radio data from ISWI instruments
- 35 PhD students from Ethiopia, African countries, and other countries in the region attended
- Scientists from Ethiopia, Greece, India, Italy, UK, USA lectured and ran hands-on activities in analyzing space- and ground-based data
- Agencies interested in space weather co-sponsored



SCOSTEP Visiting Scholar (SVS) Program

- The objective is to train young scientists and graduate students from developing countries in established laboratories of solar terrestrial physics for 1-3 months
- Funding: SCOSTEP will provide the airfare, while the hosting lab will provide the living expenses (lodging, meals, ground transportation, visa fees and other incidentals)
- Frequency: At least four scholars each year, one each related to the four VarSITI themes
- Launched in January 2015
- More labs have come forward to host SCOSTEP Visiting Scholars
- 30 students benefited so far

SVS Selection Committee

Nicole Vilmer (France) Chair

Mike Taylor (USA)

Babatunde Rabiou (Nigeria)

Alejandro Lara (Brazil)

Aki Yoshikawa (Japan)

Paul Baki (Kenya)

2016 SCOSTEP Awards



SCOSTEP Distinguished Scientists with SCOSTEP Executives

There were excellent nominations for Distinguished Scientist Awards. SCOSTEP Awards committee finalized the following scientists:

Professor Dr. Sami Solanki (Germany)
Distinguished Scientist

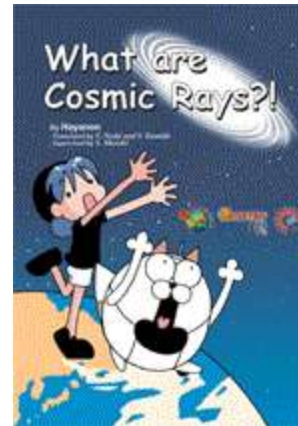
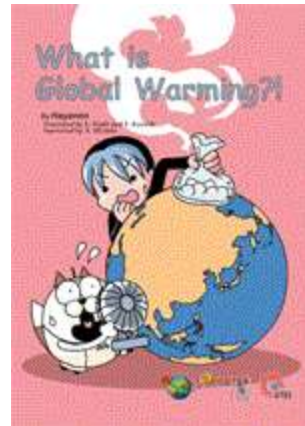
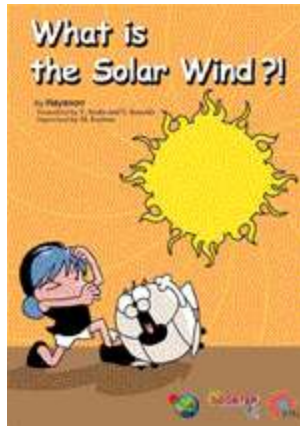
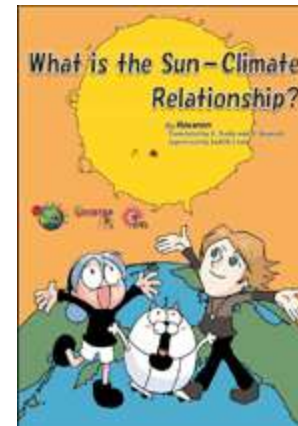
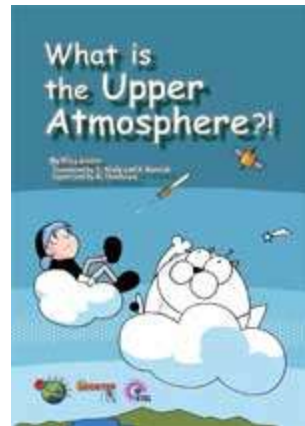
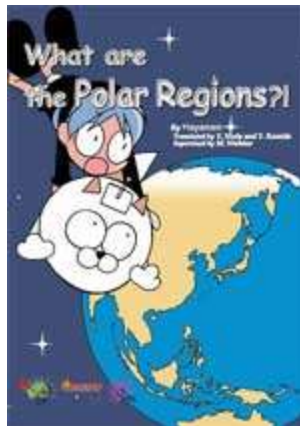
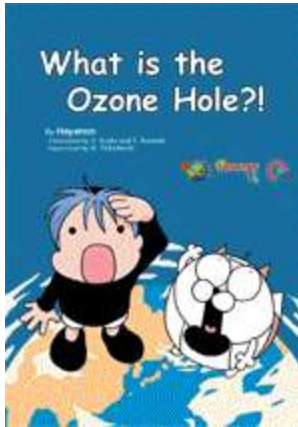
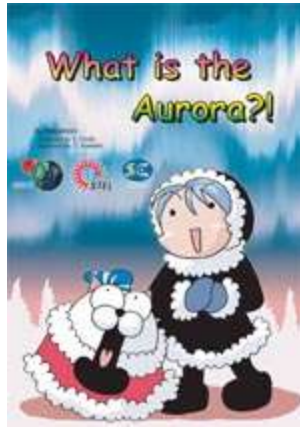


Dr. Nicholas Michael Pedatella, USA
Distinguished Young Scientist

Dr. Brent Carter, Australia
Distinguished Young Scientist



Dr. Xin Cheng, China
Honorable Mention



SCOSTEP Outreach: Comic Books

- To raise the awareness of general public on selected scientific topics (currently 9)
- Translated into many languages
- Blanks for new languages
- Available online:
yorku.ca/scostep

VarSITI General Symposium 2017: July 10-15, 2017, Irkutsk, Russia

<http://varsiti2017.iszf.irk.ru/index.php/conferences/varsiti>

- Long-term variation of the Sun, geomagnetic activity, and climate
- Coupling between the Earth's atmosphere and space and its relation to quiet and active Sun
- Understanding Earth's space environment and its connection to Space Weather
- Sun to Earth campaign events study
- Atmospheric response to solar variability and modulation of its impact on timescales from minutes to decades
- Data archiving and analysis tools
- Advanced Concepts in Solar-Terrestrial Coupling in the Context of Space Weather (A Concepts and Tools School for Students)
- Special Issue in Journal of Atmospheric and Solar-Terrestrial Physics (JASTP): Advanced Concepts in Solar-Terrestrial Coupling in the Context of Space Weather (Spring 2018)



Institute of Solar-Terrestrial Physics



SCOSTEP 14th Quadrennial Solar-Terrestrial Physics Symposium

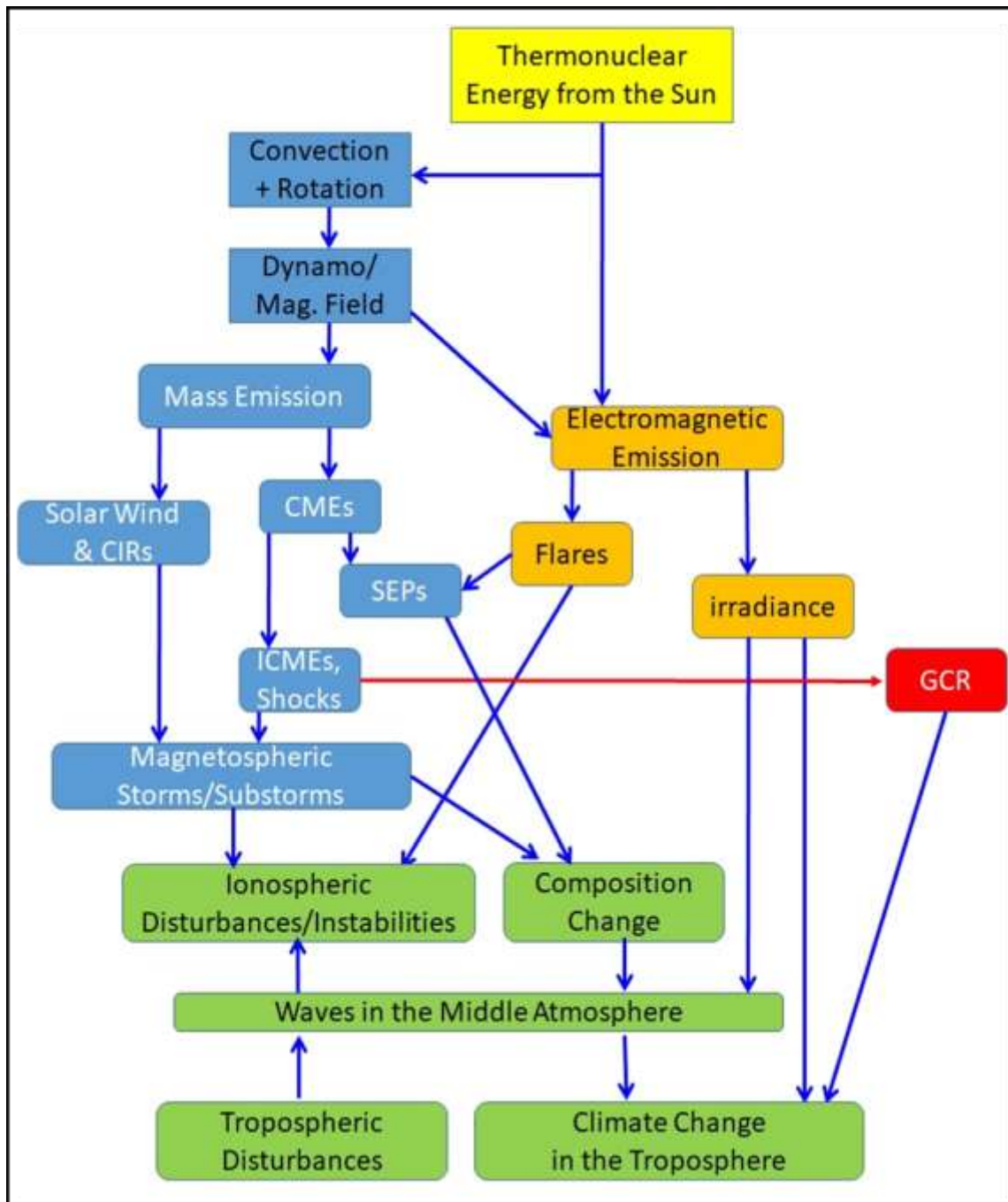
July 9 – 13, 2018 Toronto, Canada



- 150 scientists from 26 countries
- Presentations available online:
<http://www.scostepevents.ca/sessions-and-abstracts/presentations-according-to-session/>

Publications to
be combined
with those of
the closing
symposium

COSPAR . IAGA . IAMAS . IAU . IUPAP . SCAR . URSI . WDS



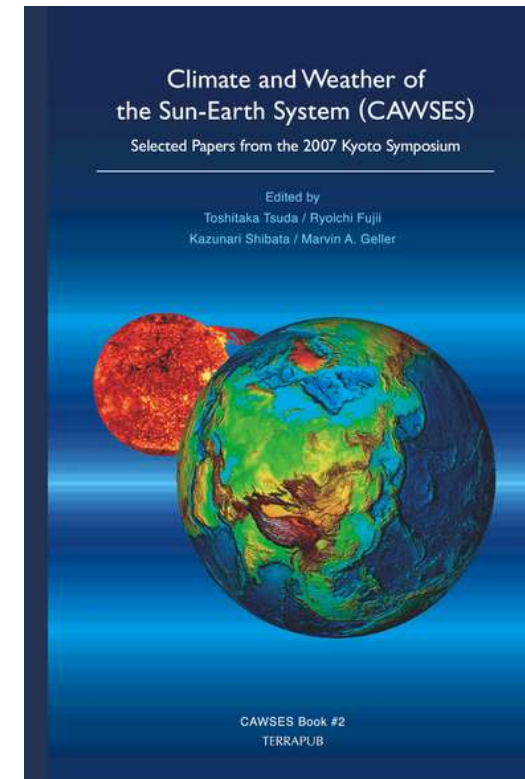
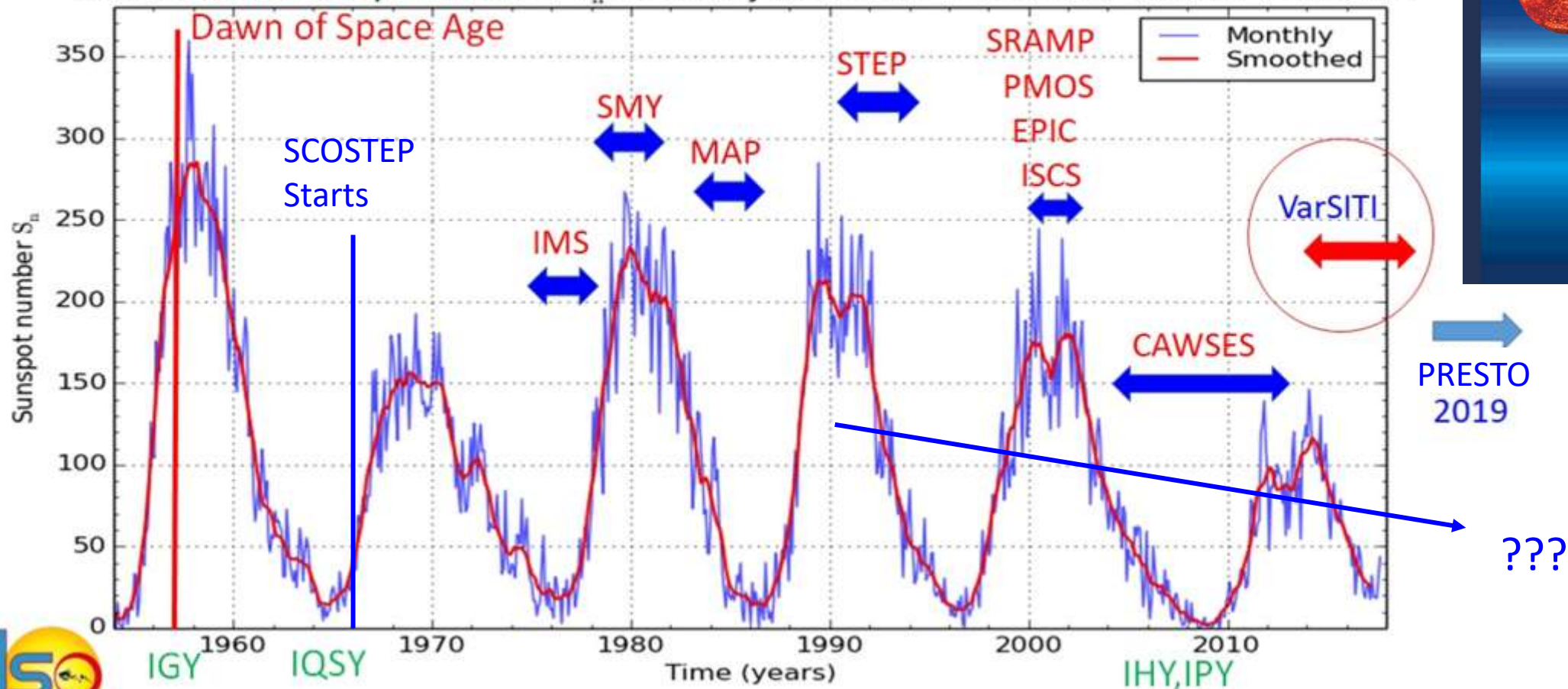
SCOSTEP Focus

- Four channels of energy flow
- International
- **Interdisciplinary**
- Not doable by a single group or country
- Need ***ALL*** Scientific unions
- Good focus for funding agencies

Half a Century of SCOSTEP Programs

Solar Variability and SCOSTEP Scientific Programs

International sunspot number S_{ii} : monthly mean and 13-month smoothed number



Variability of the Sun and Its Terrestrial Impact (VarSITI)

varsiti.org

launched on
January 13, 2014

2014-2018

Four Major Projects



Co-chairs



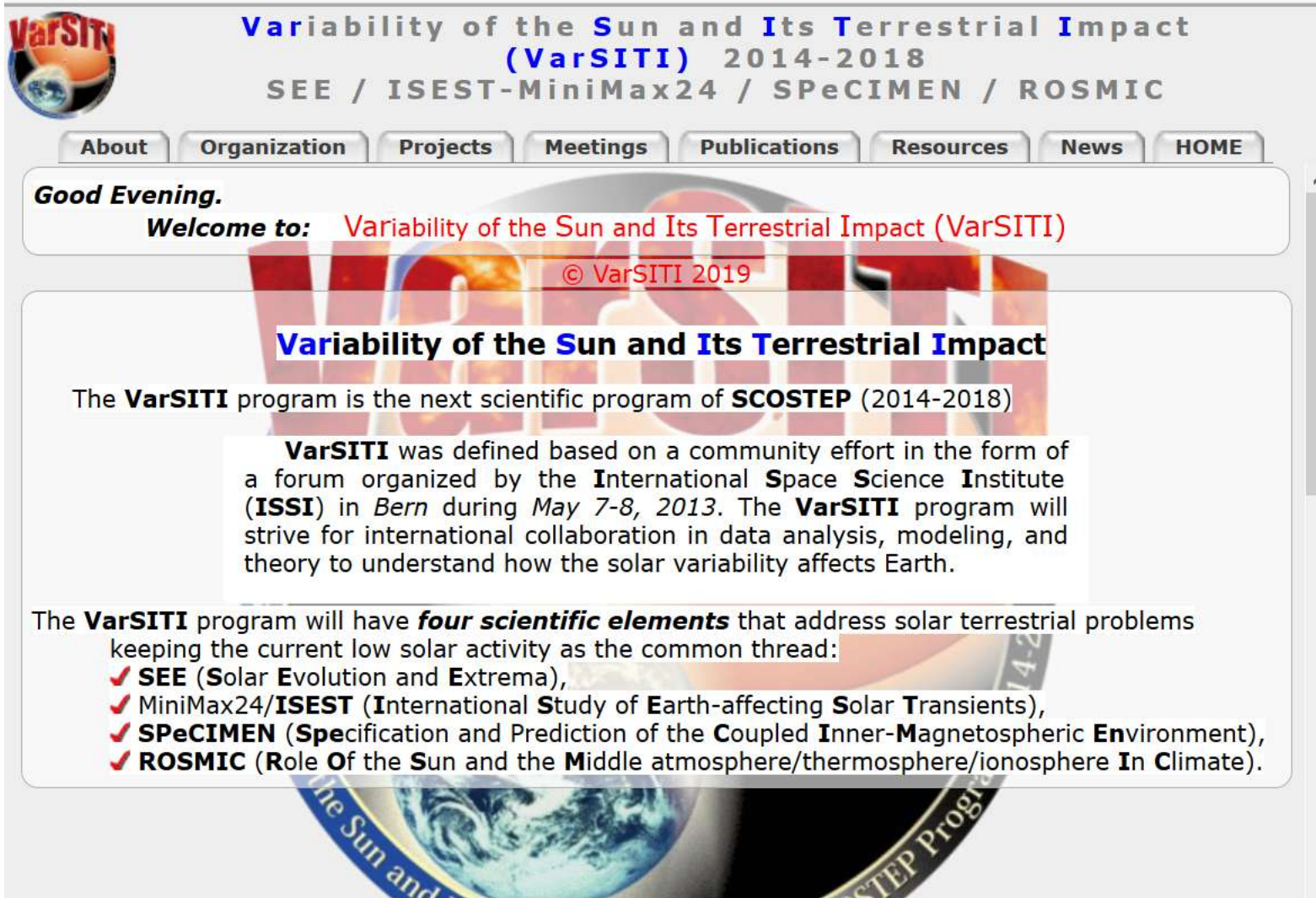
Kazuo Shiokawa (Japan)



Katya Georgieva (Bulgaria)

<http://www.youtube.com/watch?v=couR4MyxNPY>

<http://www.varsiti.org>



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

About Organization Projects Meetings Publications Resources News HOME

Good Evening.
Welcome to: Variability of the Sun and Its Terrestrial Impact (VarSITI)
© VarSITI 2019

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).



Mitko Danov
Web Master



VarSITI 2014

1,293 views

👍 5 💬 0 ➦ SHARE ≡+ SAVE ...

<https://www.youtube.com/watch?v=couR4MyxNPY>



Variability of the Sun and Its Terrestrial Impact

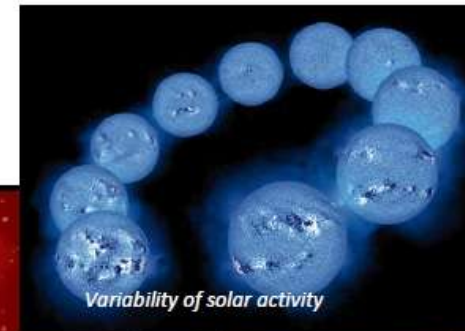
VarSITI

SCOSTEP is an ICSU Interdisciplinary Body tasked with the responsibility to organize long-term scientific programs in solar terrestrial physics and *Variability of the Sun and Its Terrestrial Impact (VarSITI)* is that program for the period 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 in May 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:

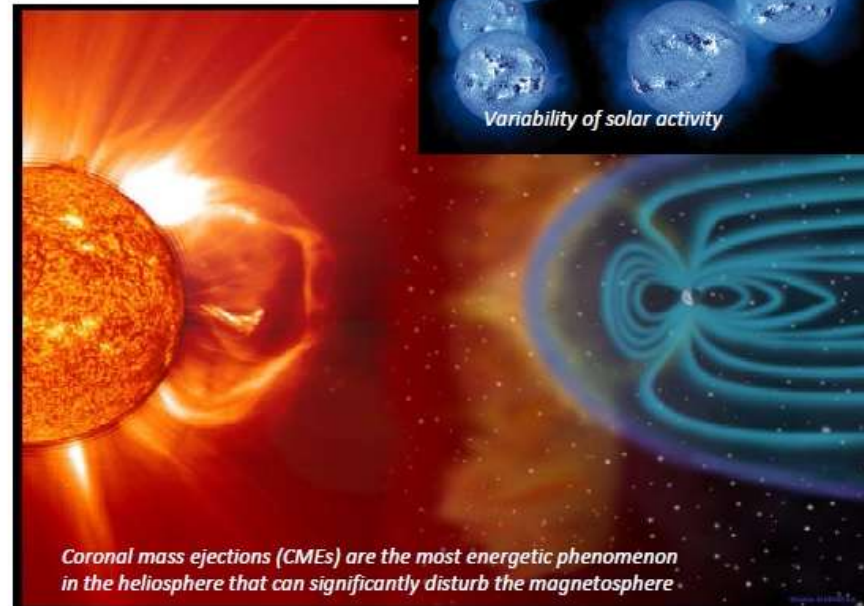
- 1) SEE (Solar evolution and Extrema)
- 2) ISEST (International Study of Earth-affecting Solar Transients/MiniMax24)
- 3) SPeCIMEN (Specification and Prediction of the Coupled Inner-Magnetospheric Environment), and
- 4) ROSMIC (Role Of the Sun and the Middle atmosphere/thermosphere/ionosphere In Climate).

VarSITI Co-Chairs:

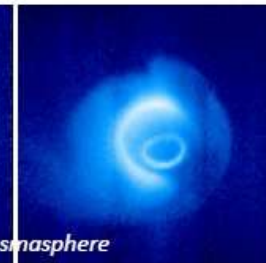
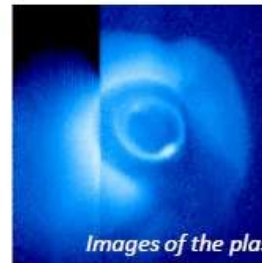
Prof. Katya Georgieva, Bulgaria
Prof. Kazuo Shiokawa, Japan



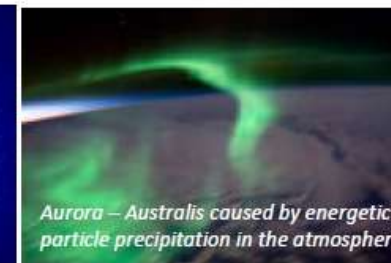
Variability of solar activity



Coronal mass ejections (CMEs) are the most energetic phenomenon in the heliosphere that can significantly disturb the magnetosphere



Images of the plasmasphere



Aurora – Australis caused by energetic particle precipitation in the atmosphere

VarSITI Brochure

Highlights

- **VarSITI** brought together worldwide resources, including space- and ground-based data, virtual data bases, distributed modelling centers, and theories to make rapid progress in the projects.
 - Encourages communication among sub-disciplines
 - Runs a dedicated website, quarterly newsletter, organizes symposia
 - 132 data bases relevant to STP research have been documented in <http://www.varsiti.org>
 - Has supported ~50 professional meetings; conducted two VarSITI symposia
 - Significant presence in Quadrennial Symposia (STP13, STP14)
 - About 100 refereed articles published in 4 years

Significant Meetings (Publications)

- 2014 STP13 in Xi'An China (JGR)
- 2016 First VarSITI General Symposium, Albana, Bulgaria (JASTP)
- 2017 Second VarSITI General Symposium, Irkutsk, Russia (JASTP)
- 2018 STP14 in Toronto, Canada (TBD)
- 2019 VarSITI Final Symposium, Sofia, Bulgaria (TBD)
- Also, Project-specific workshops and publications
- ISSI working groups

VarSITI-related special issues

- **JGR: VarSITI Special Section in JGR-Space Physics**
- **EPS: Global Data Systems for the Study of Solar-Terrestrial Variability (from SCOSTEP-WDS workshop)**
- **JASTP: ISSI/VarSITI Forum on Solar activity in the following decades**
- **Solar Physics: Earth-affecting solar transients**
- **JASTP: long-term changes and trends in the upper atmosphere**
- **JASTP: Special issue of the VarSITI-2016 symposium**
- **JASTP: Special issue of the VarSITI-2017 symposium**

- **EPS: 12th international conference on substorms (ICS-12)**
- **JASTP: special issue of vertical coupling workshop (Antalya workshop)**
- **JGR: Geospace system responses to the St. Patrick's Day storms in 2013 and 2015 (CEDAR based)**
- **AnnGeo: International Symposium of Equatorial Aeronomy (ISEA-14)**
- **More to come (this symposium + Reviews)**

Quarterly update on the VarSITI program and developments in Solar Terrestrial Physics

SOSTEP
Scientific Committee on Solar-Terrestrial Physics

VarSITI

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

Vol. 21, May 2019

VarSITI Newsletter

Inside this issue

Article 1:
Virtual Laboratory for the comprehensive analysis of Forbush-Effects and Interplanetary Disturbances1

Article 2:
Ionosphere and Magnetic Data - Kiyichi (IMD-K)3

Highlight on Young Scientists 1:

Project ISEST

Article 1:
Virtual Laboratory for the comprehensive analysis of Forbush-Effects and Interplanetary Disturbances

A. Belov, A. Abunin, E. Eroshenko, M. Abunina, V. Yanke, V. Oleneva
Institute of Terrestrial Magnetism, Ionosphere and Radiowave Propagation
by N.V. Pushkov, RAS (IZMIRAN), Troitsk, Moscow, Russia

- 21 volumes
- archived at varsiti.org
- Science articles
- Young scientist highlights
- short news items



Mai Asakura

PRESTO: 3 Pillars - 9 Focus Areas

1. Sun, Interplanetary Space and Geospace

- 1.1 Occurrence and properties of flares and CMEs/CIRs and the propagation of CMEs/CIRs from the Sun to the Earth
- 1.2. Predictability of interplanetary shocks and energetic particle flux enhancements
- 1.3. Predictability of substorms and storms
- 1.4. Solar wind-magnetosphere coupling and internal magnetospheric dynamics

2. Space Weather and Earth System

- 2.1 Multiscale vertical and horizontal coupling between atmospheric regions and its effects on space weather
- 2.2 Effect of atmospheric waves on the global circulation in the middle and upper atmosphere

3. Solar Activity and its Influence on Climate

- 3.1 Understanding and predicting solar activity
- 3.2 Sub-seasonal to decadal variability of the terrestrial system
- 3.3 Centennial variability of the terrestrial system

NSP Committee

Ioannis Daglis (Greece) Chair

Daniel Marsh (USA)

Loren Chang (Taiwan)

Sergio Dasso (Argentina)

Sarah Gibson (USA)

Katja Matthes (Germany)

Dibyendu Nandy (India)

Olga Khabarova (Russia)

Annika Seppälä (New Zealand)

Rémi Thiéblemont (France)

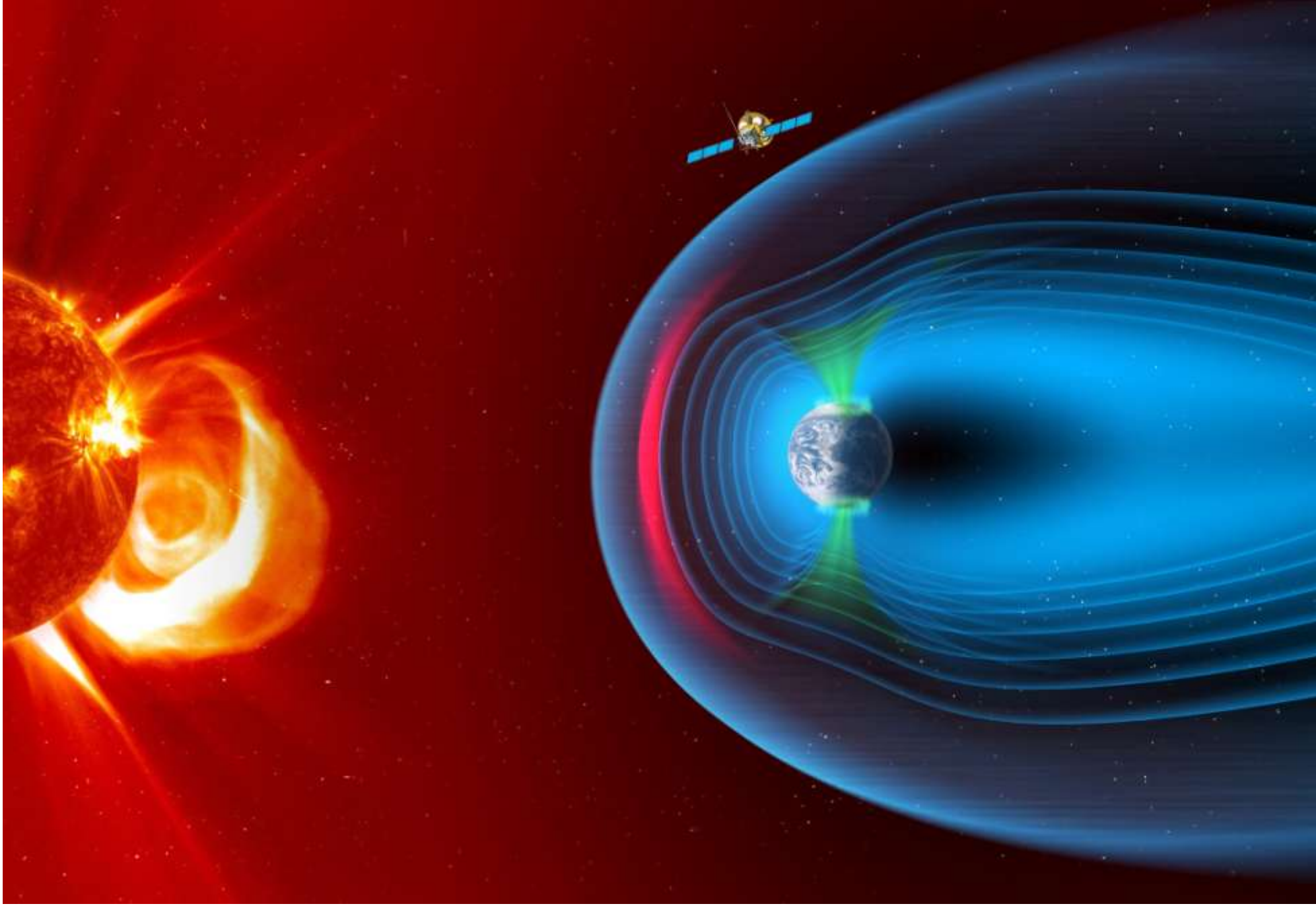
Qiu-Gong Zong (China)

Emilia Kilpua (Finland)

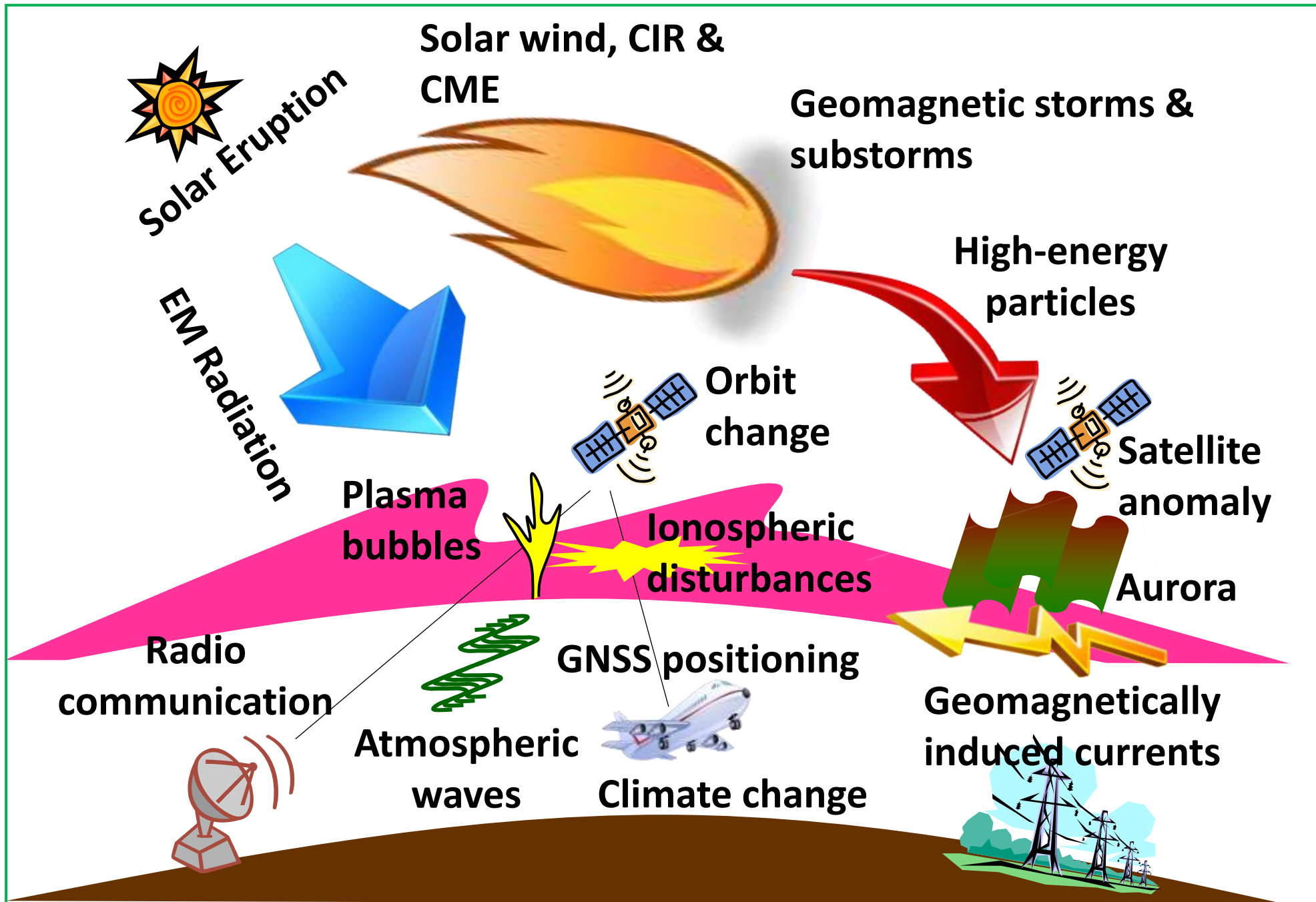
PRESTO: Predictability of the variable Solar-Terrestrial Coupling

nat.Gopalswamy@nasa.gov

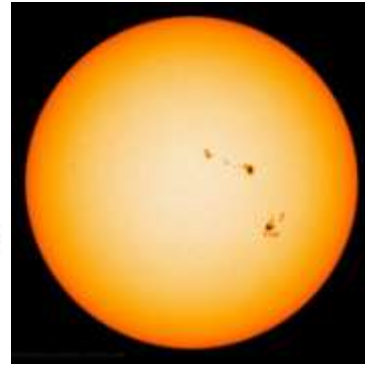
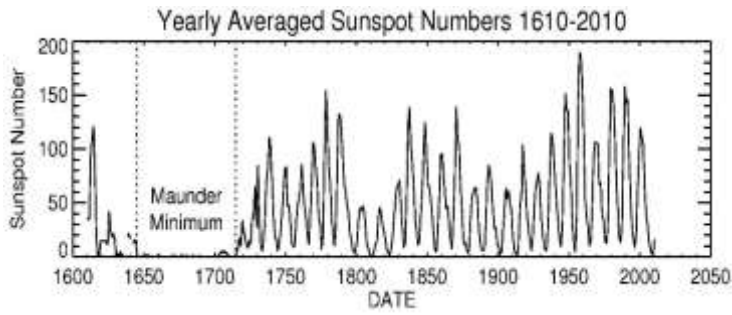
Sun, Interplanetary Space and Geospace



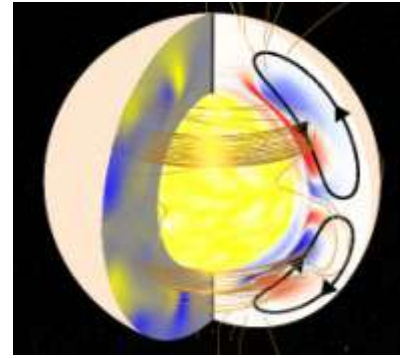
Space Weather and Earth System



Solar Activity and its Influence on Climate



Solar dynamo



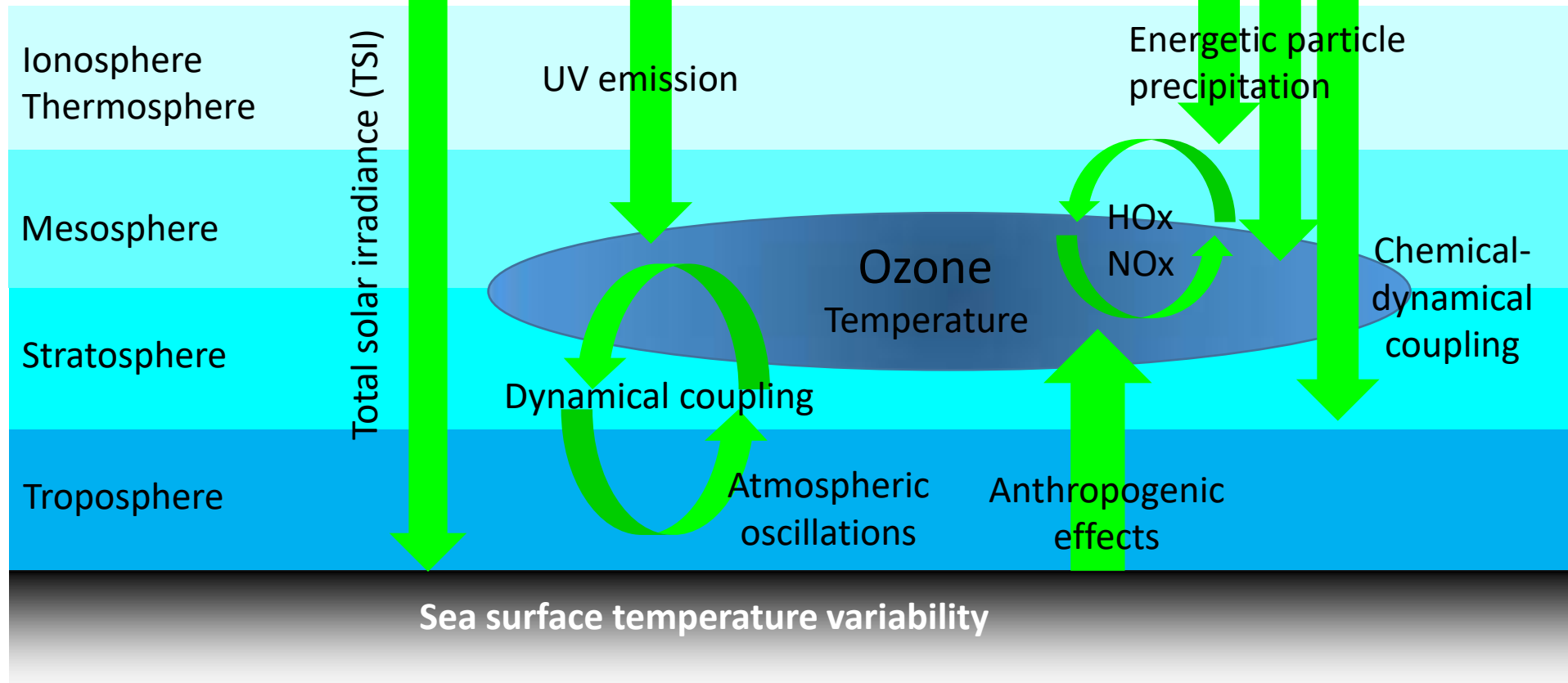
NASA

Interplanetary space

Magnetosphere

Solar energetic particles

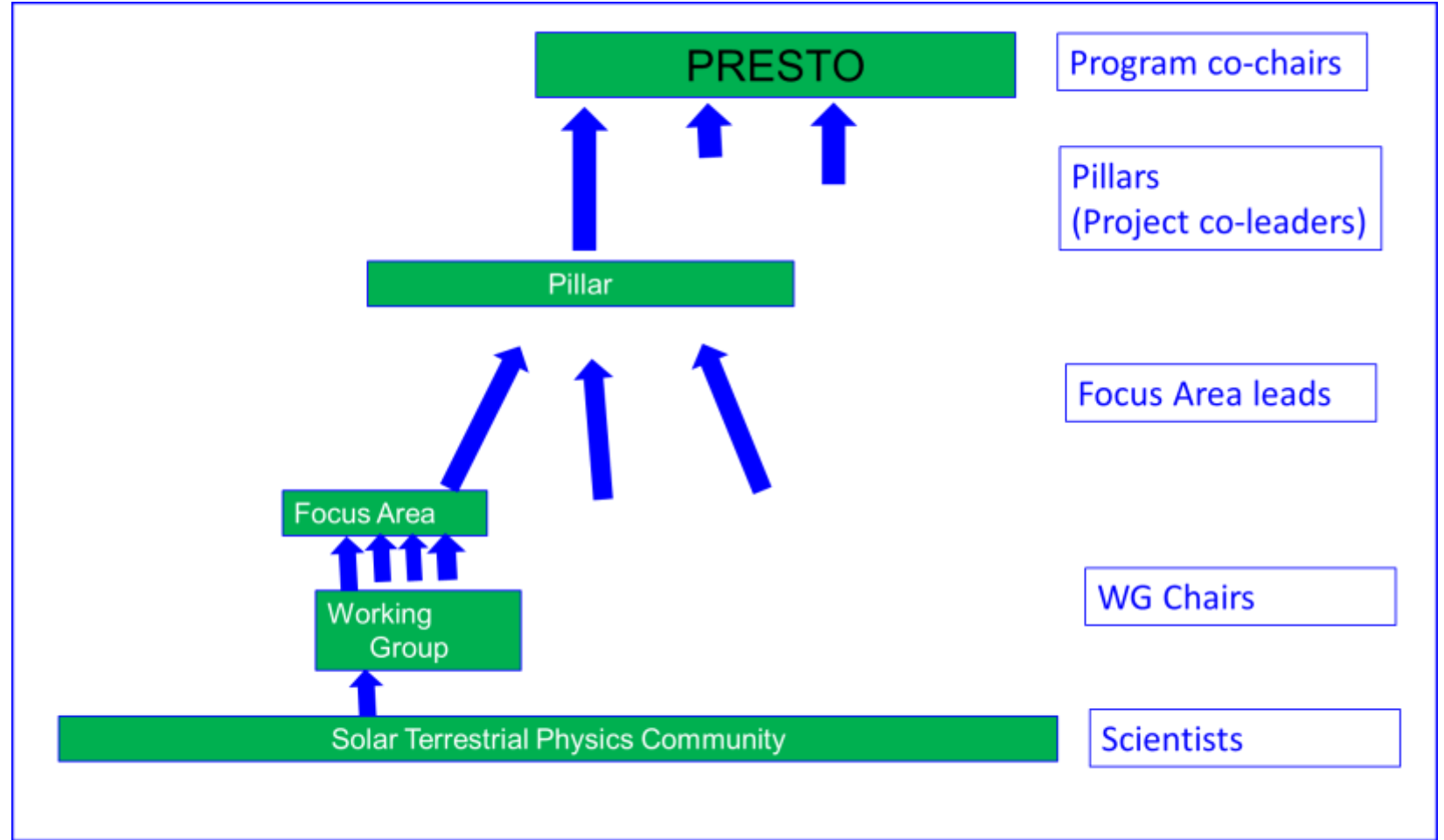
magnetospheric particles



L. Gray

Projects and Working Groups

- Annual Symposia
- ISSI Working Groups
- Special sessions
- Support related meetings
- Special Issues of journals
- Books
- Capacity Building



Generic Organizational Chart

Summary

- SCOSTEP has been running long-term scientific programs over half a century that accumulate new knowledge in solar terrestrial physics
- VarSITI is the current scientific program that has engaged more than 1000 scientists worldwide during 2014-2018
- The legacy will be publications, including the output of the present symposium and the final review in Nov 2019
- The next scientific program is PRESTO: Predictability of the Variable Solar Terrestrial Coupling
- SCOSTEP programs will continue to be closely associated with capacity building activities: Schools, Workshops, and SVS programs
- Remember to nominate deserving colleagues for service and science achievements