Current status of SCOSTEP’s PRESTO program for predictability of the variable solar-terrestrial coupling

Kazuo Shiokawa
(SCOSTEP President)
A thematic organization of the International Science Council (ISC) and a permanent observer at UNCOPUOS.

Runs long-term (4-5 years) international interdisciplinary scientific programs of solar terrestrial physics since 1966

Interacts with national and international programs involving solar terrestrial physics elements

Engages in Capacity Building activities such as the Space Science Schools with UNOOSA/ISWI.

Disseminates new knowledge on the Sun-Earth System and how the Sun affects life and society as outreach activities.
### Current Member Countries and Geographical Regions of SCOSTEP

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<th>Australia</th>
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International interdisciplinary programs in solar-terrestrial physics operated by SCOSTEP

1976-1979: IMS (International Magnetosphere Study)
1979-1981: SMY (Solar Maximum Year)
1982-1985: MAP (Middle Atmosphere Program)
1998-2002: Post-STEP (S-RAMP, PSMOS, EPIC, and ISCS)
2004-2008: CAWSES (Climate and Weather of the Sun-Earth System)
2009-2013: CAWSES-II (Climate and Weather of the Sun-Earth System-II)
2014-2018: VarSITI (Variability of the Sun and Its Terrestrial Impact)
2020-2024: PRESTO (Predictability of the variable Solar-Terrestrial Coupling)
SCOSTEP’s international program in 2020-2024

**PRESTO: Predictability of the variable Solar-Terrestrial Coupling**

PRESTO identifies predictability of the variable solar-terrestrial coupling performance metrics through modeling, measurements, and data analysis and to strengthen the communication between scientists and users.

**Pillar 1: Sun, interplanetary space and geospace**

**Pillar 2: Space weather and the Earth’s atmosphere**

**Pillar 3: Solar activity and its influence on the climate of the Earth System**

For subscription on the SCOSTEP-all mailing list, send e-mail to “scosteprequest@bc.edu”.
SCOSTEP's international program in 2020-2024

**PRESTO: Predictability of the variable Solar-Terrestrial Coupling**

**PRESTO chair and co-chairs**

- **Chair**
  - Ramon E. Lopez (USA)
- **Co-chair**
  - Eugene Rozanov (Switzerland)
- **Co-chair**
  - Jie Zhang (USA)

**Pillar 1: Sun, interplanetary space and geospace**

- Allison Jaynes (USA)
- Emilia Kilpua (Finland)
- Spiros Patsourakos (Greece)

**Pillar 2: Space weather and the Earth’s atmosphere**

- Loren C. Chang (Taiwan)
- Duggirala Pallamraju (India)
- Nick M. Pedatella (USA)

**Pillar 3: Solar activity and its influence on the climate of the Earth System**

- Odele Coddington (USA)
- Jie Jiang (China)
- Stergios Misios (Greece)
Solar cycle

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

Cycle 25 Predictions

Nandy (2021)
https://doi.org/10.1007/s11207-021-01797-2

SILSO graphics (http://sidc.be/silso) Royal Observatory of Belgium 2022 February 1
Small geomagnetic storm on Feb.3-5, 2022
→ Expansion of the upper atmosphere
→ Atmospheric drag increase.
→ Up to 40 Starlink satellites of SpaceX is getting lost into the Earth’s atmosphere
(https://www.spacex.com/updates/, Feb. 8, 2022)
Pomoell & Poedts (2018) https://doi.org/10.1051/swsc/2018020
Jing et al. (2021, DOI: 10.1175/JCLI-D-20-0743.1)

Earth surface temperature

(a) Surface Temperature (CESM2)

(b) Differences (TSIS-1 - CESM2)

(c) Diff in Surface Temperature

Max 0.39
Mean -0.43
Min -1.31

(d) Diff in Surface Temperature

Max 0.29
Mean -0.27
Min -1.42

Northern hemisphere

Southern hemisphere

South pole
Latitude equator
North pole

Jing et al. (2021, DOI: 10.1175/JCLI-D-20-0743.1)
PRESTO Website at Boston College: https://scostep.org/

SCOSTEP
Scientific Committee on Solar-Terrestrial Physics

SCOSTEP/PRESTO

Predictability of the Solar-Terrestrial Coupling

PRESTO is a science program that seeks to improve the predictability of energy flow in the integrated Sun-Earth system on times scales from a few hours to centuries through promoting international collaborative efforts. PRESTO is sponsored by SCOSTEP, the Scientific Committee on Solar Terrestrial Physics.

For subscription on the SCOSTEP-all mailing list: drop e-mail to “scosteprequest@bc.edu”.
SCOSTEP/PRESTO Funding Opportunities

- SCOSTEP/PRESTO provides financial support for organizing international campaigns and meetings every year.

- SCOSTEP also provides financial support for capacity building activities.
7th SCOSTEP/PRESTO Online Seminar
Title: Physics at the edge between Earth's atmosphere and space
Author: Dr. Franz-Josef Lübken (Leibniz-Institute of Atmospheric Physics, Germany)
Date and Time: May 21 (Fri), 2021, 12:00-13:00 UT

8th SCOSTEP/PRESTO Online Seminar
Title: The Sun making history. The mechanism behind the varying amplitude of the solar cycle
Author: Prof. Dr. Kristof Petrovay (ELTE Eotvos Lorand University, Department of Astronomy, Hungary)
Date/time: June 8 (Tue), 2021, 13:00-14:00 UT

9th SCOSTEP/PRESTO Online Seminar
Title: Space Weather in the Thermosphere-Ionosphere System - observations and Insights from the GOLD*
Mission (*Global-scale Observations of the Limb and Disk)
Author: Dr. Richard Eastes (Laboratory for Atmospheric and Space Physics, University of Colorado Boulder, USA)
Date/time: September 23, 2021 14:00-15:00 UT

10th SCOSTEP/PRESTO Online Seminar
Title: Understanding and Modeling Solar Eruptions: Where Do We Stand?
Speaker: Dr. Tibor Török (Predictive Science Inc., USA)
Date/time: November 30, 2021 23:00-24:00 UT

11th SCOSTEP/PRESTO Online Seminar
Title: Understanding and Modeling Solar Eruptions: Where Do We Stand?
Speaker: Dr. Cora Randall (University of Colorado, USA)
Date/time: February 10 (Thu), 2022, 14:00-15:00 UT
6th SCOSTEP Online Capacity Building Lecture
Topic: Aurora as a manifestation of electromagnetic waves in space
Speaker: Keisuke Hosokawa (University of Electro-Communications, Japan)
Date/time: June 28 (Mon), 2021, 10:30-12:00 UTC
registration: 191, participation: 113

7th SCOSTEP Online Capacity Building Lecture
Topic: Energetic Electron Precipitation from the Radiation Belts: How plasma waves in space kill atmospheric ozone
Speaker: Craig Rodger (Dept. of Physics, University of Otago, New Zealand)
Date/time: August 19 (Thu), 2021, 00:30-01:30 UTC
registration: 157, participation: 47

8th SCOSTEP Online Capacity Building Lecture
Topic: Solar Magnetic Fields: Their Origin and Predictability
Speaker: Dibyendu Nandi (Indian Institute of Science Education and Research, Kolkata, India)
Date/time: Sept. 14 (Tue), 2021, 10:30-11:30 UTC
registration: 202, participation: 88

9th SCOSTEP Online Capacity Building Lecture
Topic: Whole Heliosphere and Planetary Interactions (WHPI): Connecting Sun to solar wind to planets during "quiet" times of the solar cycle
Speaker: Sarah Gibson (High Altitude Observatory at NCAR, Colorado, USA)
Date/time: October 21 (Thu), 2021, 00:30-01:30 UTC
registration: 173, participation: 38

10th SCOSTEP Online Capacity Building Lecture
Topic: F10.7 and solar spectral irradiance: drivers of ionosphere models
Speaker: Samuel Schonfeld (Boston College, Massachusetts, USA)
Date/time: November 16 (Tue), 2021, 01:00-02:00 UTC
registration: 147 participation: 33

11th SCOSTEP Online Capacity Building Lecture
Topic: The energetics of sprites: New results from South Africa
Speaker: Michael Kosch (South African National Space Agency, South Africa)
Date/time: January 27 (Thu), 2022, 11:00-12:00 UTC
registration: 111 participation: 51
SCOSTEP/PRESTO Newsletter vol.21-30

Every 3 months: Articles, Highlight of young scientists, Meeting reports, and Short news
15th Quadrennial Solar-Terrestrial Physics Symposium

21 – 25 February 2022
Alibag, India (Hybrid or Fully Virtual)
Hosted by Indian Institute of Geomagnetism (IIG)

15th Quadrennial Solar-Terrestrial Physics Symposium (STP-15)

S1 - Overarching Topics in the Sun-Earth Connection
S2 - PRESTO Pillar 1: Sun, Planetary Space, and Geospace
S3 - PRESTO Pillar 2: Space Weather and Earth's Atmosphere
S4 - PRESTO Pillar 3: Solar Activity and its Influence On Climate
S5 - Space Weather Prediction and Implementation
S6 - Modelling, Database and Data Analysis Tools for Solar-Terrestrial Physics
S7 - New ground- and space-based initiatives for Solar-Terrestrial Physics
S8 - Special Session on “Geomagnetism-The Connecting Link between Sun and Earth”

~350 presentations

https://stp15.in
Capacity Building Schools

In 2021:
- The 44th Annual Scientific Seminar on Physics of Auroral Phenomena, 15-19 March 2021, Apatity, Russia
- The first summer school on space research, technology and application in Bulgaria, 5-11 July 2021, National Observatory Rozhen, Bulgaria
- ISWI/SCOSTEP Iberian Space Weather School, July 21-25, 2021, University of Coimbra, Portugal

In 2022:
- The 2nd summer school on Space research, technology and application, 3-10 July 2022, National Astronomical Observatory (NAO) – Rozhen, Bulgaria
- Sumer Space Weather School - Physics and use of tools, Houphouët Boigny University, Abidjan, October, 2022, Côte d’Ivoire
- Iberian Space Weather School, July 20-24, 2022, University of Alcala, Spain
- Describing and Analyzing Solar Data for a better prediction of Space Weather, TBD, 2021, Kigali, Rwanda
SCOSTEP - Science Comic Books

https://scostep.org/
Summary

• PRESTO is the current SCOSTEP scientific program to run during 2020-2024 to understand Predictability of the variable Solar-Terrestrial Coupling

• Scientists from all over the world participate in the PRESTO program to understand predictability of space weather and solar effect on climate.

• Solar terrestrial science will reach as many developing countries as possible via SCOSTEP’s capacity building and outreach activities.

PRESTO: Predictability of the variable Solar-Terrestrial Coupling
SCOSTEP: Scientific Committee on Solar-Terrestrial Physics