

SCOSTEP 15th Quadrennial Solar-Terrestrial Physics Symposium (STP-15): 2nd Circular

Date: February 21-25, 2022

Location: Full Online or Hybrid at Alibag, India

Conference Website: <https://www.stp15.in/>

Symposium description:

The Scientific Committee on Solar-Terrestrial Physics (SCOSTEP) organizes the Solar-Terrestrial Physics (STP) symposium once every four years. SCOSTEP is engaged in three major activities: long-term scientific programs, capacity building and public outreach. The scientific programs are of interdisciplinary nature involving scientists from around the world. They are designed to advance our understanding of the solar-terrestrial relationship using space- and ground-based observations, cutting-edge models and theory. Under what ways the Sun affects the Earth and its environment over various time scales is the underlying theme of the scientific programs pursued under SCOSTEP. Having addressed the variability component during the recently concluded Variability of the Sun and its Terrestrial Impact (VarSITI) program, the new program of SCOSTEP, Predictability of the variable Solar-Terrestrial Coupling (PRESTO), addresses the predictability component of those phenomena that have impact on the Sun-Earth system as a whole over various time scales.

The SCOSTEP 15th Quadrennial Solar-Terrestrial Physics Symposium (STP-15) will aim to gather eminent scientists from solar, magnetospheric, ionospheric and atmospheric physics communities to discuss and deliberate on the cutting-edge sciences pertaining to STP, especially the coupling across disciplines. STP-15 will address the predictability as a focus area in each of the traditional topics deliberated upon during the earlier STP meetings, namely, the mass and radiation chains and intra-atmospheric coupling.

Important deadlines:

Abstract submission: September 15, 2021

Financial support request: September 15, 2021

Notification of acceptance/rejection of abstracts: October 31, 2021

Registration commences: January 1, 2022

(Early Bird registration period: November 1 – December 31, 2021, Regular registration: January 1 – February 19, 2022, On the spot registration: February 20-25, 2022)

Conference dates: February 21-25, 2022

Confirmed Keynote Speakers: Dipankar Banerjee, Robert Cameron, Drew Turner

Confirmed Invited Speakers: Ashwini Kumar Sinha, Alexi Glover, Amoré Nel, Annika Drews, Camilla Scolini, Claudia Stolle, Dibyendu Chakrabarty, Dibyendu Nandi,

Durgesh Tripathi, Eleanna Asvestari, Erik Richard, Gurbax Lakhina, Huixin Lin, Ian McCrea, Ioannis Daglis, Jim Spann, Juergen Matzka, Kanya Kusano, Lynn Harvey, Manolis Georgoulis, Natalie Krivova, Raffaele Marino, Seiki Asari, Teresa Nieves-Chinchilla, Theodoros Sarris, Ville Maliniemi, Yosuke Yamazaki

Session structures

Session 1. Overarching topics in Sun-Earth connection
Session 2. PRESTO Pillar 1: Sun, Planetary Space, and Geospace
Session 3. PRESTO Pillar 2: Space Weather and Earth's Atmosphere
Session 4. PRESTO Pillar 3: Solar Activity and its Influence On Climate
Session 5. Space Weather Prediction and Implementation
Session 6. Modeling, Database and Data Analysis Tools for Solar-Terrestrial Physics
Session 7. New ground- and space-based initiatives for Solar-Terrestrial Physics
Session 8: Special session on "Geomagnetism- The connecting link between Sun and Earth"

Session Descriptions:

Session 1. Overarching Topics in Sun-Earth Connection

Conveners: **Ramon Lopez**, Eugene Rozanov, Jie Zhang, M. Venkat Ratnam

The Predictability of the variable Solar-Terrestrial Coupling (PRESTO) program focuses on the predictability of phenomena in the Sun-Earth environment, ranging from solar activity to the effects on Earth's magnetosphere, ionosphere, and neutral atmosphere down to the troposphere. PRESTO covers both short time-scale phenomena such as solar eruptions long time-scale ones such as solar influences on climate. There are three scientific Pillars in the PRESTO program: Sun, Planetary Space, and Geospace, Space Weather and Earth's Atmosphere, and Solar Activity and its Influence On Climate. In this session we will provide an overview of the PRESTO Pillars and the science questions that they address. We will also provide details on the activities of the PRESTO program (including grant support to PRESTO-related activities), and mechanisms for getting involved in the PRESTO program and contributing to the resolution of the science questions. In addition, this session welcomes presentations that connect regions and time scales of different Pillars, and the general topic of the Sun-Earth connection with an emphasis on the scientific basis of predictability.

Session 2. PRESTO Pillar 1: Sun, Planetary Space, and Geospace

Conveners: **Allison Jaynes**, Emilia Kilpua, Spiros Patsourakos, Nandita Srivastava

The Pillar 1 session will focus on the topic of accurate predictions of geospace weather, highlighting the role of propagating solar wind structures, magnetospheric dynamics, and magnetosphere-ionosphere coupling in geoeffective space weather events. Open questions include the following: Are there predictors of geoeffective solar eruptions, CMEs, and SEP events? What model inputs are necessary for the successful forecasting of solar events and their subsequent effects on the magnetosphere-ionosphere system?

How are inner magnetospheric dynamics driven by solar wind structures? We solicit presentations on these topics, especially those spanning model and data use to arrive at more accurate predictions of heliospheric transients and their resulting geospace disturbances.

Session 3. PRESTO Pillar 2: Space Weather and Earth's Atmosphere

Conveners: **Loren Chang**, Duggirala Pallamraju, Nick Pedatella

The thermosphere and the ionosphere (IT system) form the interface between geospace and the Earth's atmosphere, while also serving as the operational environment for the majority of Earth orbiting satellites, and strongly influencing satellite and terrestrial navigation and communications systems. The IT system is affected by solar and geomagnetic drivers from above, as well as from waves and tides originating in the lower atmosphere. This session will address questions relevant to understanding the effects of these physical and chemical drivers and the predictability of the IT system as whole.

Session 4. PRESTO Pillar 3: Solar Activity and its Influence On Climate

Conveners: **Odele Coddington**, Jie Jiang, Stergios Misios, Subramanian Gurubaran

Reliable decadal timescale predictions of solar activity and its influence on Earth's climate requires an improved understanding of the mechanisms modulating the solar cycle and the physical pathways wherein solar variability impacts the atmosphere, from the magnetosphere through the troposphere. In this session, we will address the mechanisms that drive the solar activity cycle, what has been learned about the solar forcing impact on the Earth's climate, and how this knowledge can be translated into future predictions of the Sun's activity and its impact on Earth's climate.

Session 5. Space Weather Prediction and Implementation

Conveners: **Kyung-Suk Cho**, Peter Pilewskie, Pravata Mohanty

For several decades, space weather prediction has been developed through a collaboration between basic science research and operational forecast to protect from a space weather disaster. However, the mechanism of space weather disturbances and their consequences have not yet been fully understood, and a gap between scientific research and operation forecast has not been reduced dramatically. This session will help the attendees to recognize the current status of space weather prediction and archive benchmarks for the better prediction and implementation of space weather.

Session 6. Modeling, Database and Data Analysis Tools for Solar-Terrestrial Physics

Conveners: **Daniel Marsh**, Yoshizumi Miyoshi, Annika Seppälä

Making significant progress in solar-terrestrial research will likely require an integrated view, where models and data are brought together using analysis tools to develop our physical understanding of the many pathways by which the Sun and Earth are coupled. This session seeks presentations on new advances in modeling of all components of the solar-terrestrial chain, established and new databases relevant to STP research and emerging data analysis tools. Presentations suitable for this session

include, but are not limited to, those that 1) identify key deficiencies in models and how to remedy them, 2) illustrate the potential of cloud computing and/or new computing architecture, 3) present new technology that enables access to observational and model data, and 4) addresses the challenges of analysing big data, standardizing data and metadata formats and the application of data science methods such as machine learning.

Session 7. New ground- and space-based initiatives for Solar-Terrestrial Physics

Conveners: **Jorge Chau**, Renata Lukianova, Nat Goplaswamy

This session involves new initiatives around the world in planning, developing, and deploying new instruments in ground- and space-based observing systems that provide new and unique data for solving problems in solar terrestrial physics. There are several new efforts to explore the solar-terrestrial environment to provide crucial data that fill current gaps. Examples of such observing platforms, in addition to ground-based ones, are: stratospheric balloons, the international space station, cubesats, small satellites, and deep space spacecraft. Instrumentation examples are innovative telescopes at various wavelengths, detectors for in-situ measurements, multistatic radar systems, compact lidars, etc. Papers dealing with all aspects of new observational infrastructure initiatives, making emphasis on data gaps to be covered, are welcome.

Session 8: Special Session on “Geomagnetism- The Connecting Link between Sun and Earth”

Conveners: **Geeta Vichare**, Gopi Seemala, Jurgen Matzka, Masahito Nose

The analysis of geomagnetic field records is crucial in understanding the solar terrestrial relationship and the dynamics and history of the Earth. Geomagnetic observatories along with the magnetic observations from various satellite missions play a significant role in the modeling of Earth’s magnetic field in the modern era. Marking the Golden Jubilee year (1971-2021) of the Indian Institute of Geomagnetism, which has been managing the Alibag observatory since its establishment in 1904, a special session is arranged. This session aims to exchange and share current research in geomagnetism and neighbouring fields, and to especially highlight their role in investigating the link between the Sun and Earth. It will provide an interdisciplinary platform for researchers to present and discuss the most recent innovations, trends, concerns, practical challenges encountered and solutions adopted in the fields of geomagnetism.

Workshop on Solar-Terrestrial Physics for Students and Young Scientists (STEPSYS)

STEPSYS workshop will be organized one day prior to the STP-15 symposium, i.e., on February 20, 2022. The objective of this workshop is to invite eminent scientists from the STP community worldwide to give tutorials/lectures to students and young scientists on topics related to Solar – Earth connections. The tentative topics include the following.

- The Sun, its interior and its atmosphere (Speaker: Dibyendu Nandi)
- Solar eruptions and their impact on Geospace (Speaker: Nat Gopalswamy)

- Magnetosphere-Ionosphere Coupling (Speaker: Ramon Lopez)
- Atmosphere - Ionosphere Coupling (Speaker: Jens Oberheide)
- Solar influence on climate variability (Speaker: Annika Seppälä)
- Space weather effects on technological systems (Speaker: Mamoru Ishii)
- Instruments and upcoming space missions for STP research (Speaker: Pallamraju Duggirala)
- Web-based tools for space weather monitoring, analysis and forecasting (Speaker: TBD)

Lectures will typically have a time duration of 45 min and will be aimed at Ph.D. students and early career scientists working on STP related topics. The lectures would provide solid foundation for the participants who would be essentially non-specialists in these areas.

This workshop is only for the registered participants of STP15 symposium