PRESTO
Predictability of the variable Solar-Terrestrial Coupling

The new SCOSTEP 5-year program in 2020-2024

Kazuo Shiokawa
(SCOSTEP President)

SCOSTEP
Scientific Committee on Solar-Terrestrial Physics

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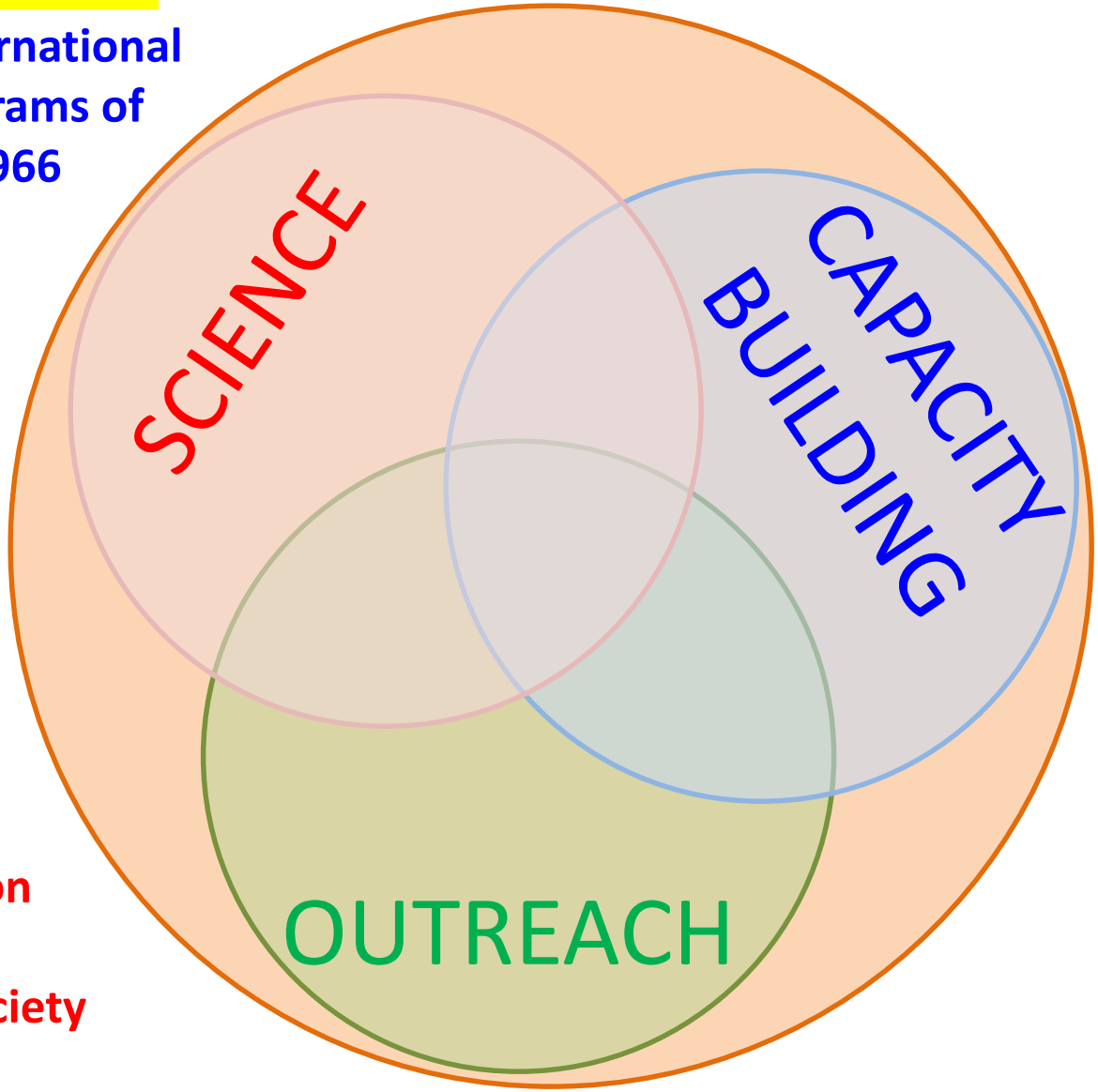
Scientific Committee on Solar-Terrestrial Physics

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 annual Space Science Schools with ISWI

Disseminates new knowledge on the Sun-Earth System and how the Sun affects life and society as outreach activities



SCOSTEP
Scientific Committee on Solar-Terrestrial Physics

Current Member Countries of SCOSTEP

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Austria
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Canada
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Indonesia
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Mexico
New Zealand
Nigeria
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Russia
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Slovakia
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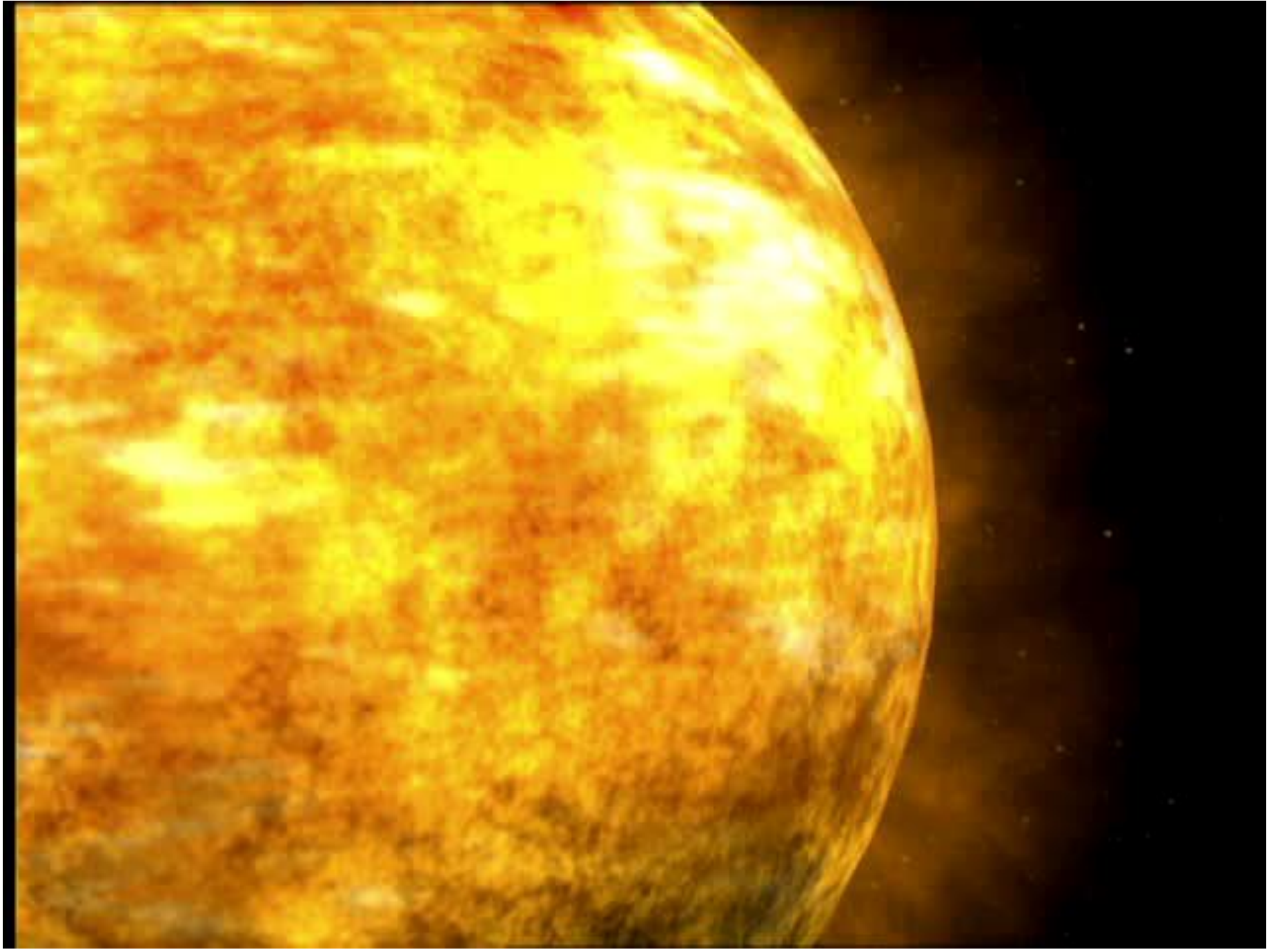
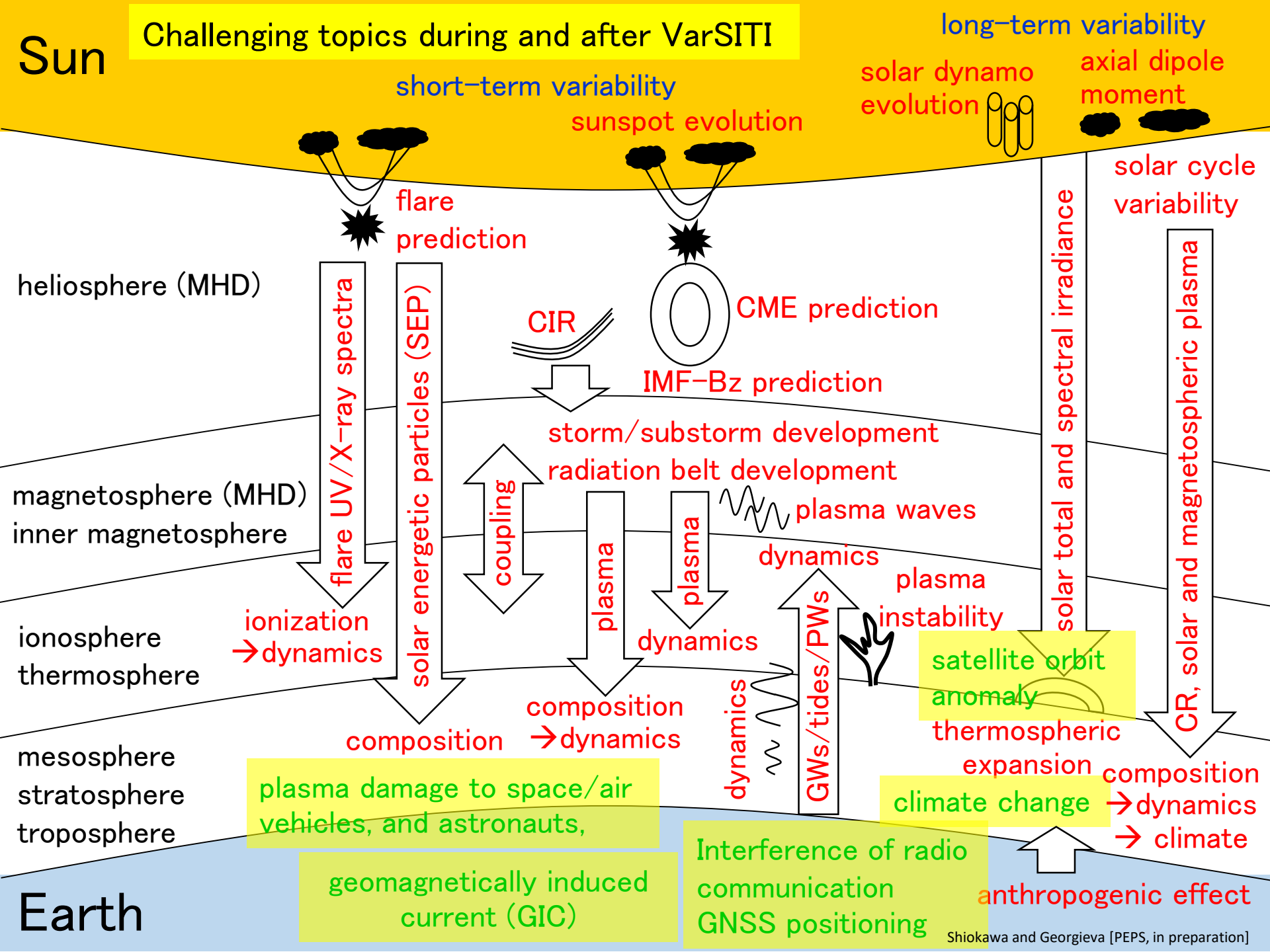


NASA schematic images



Shiokawa and Georgieva [PEPS, in preparation]

SCOSTEP
Scientific Committee on Solar-Terrestrial Physics

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)
1990-1997: STEP (Solar-Terrestrial Energy 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 Next Scientific Program (NSP) committee, chaired by I. Daglis (Greece)

Figure 6: Group picture of the participants of the Forum in 2018.

ISSI forum in Beijing, China in 2018.

SCOSTEP Next Scientific Program (NSP) committee, chaired by I. Daglis (Greece)

Figure 7: Group picture of the participants of the Forum in 2019.

ISSI forum in Bern Switzerland in 2019.

SCOSTEP

Scientific Committee on Solar-Terrestrial Physics

PRESTO:

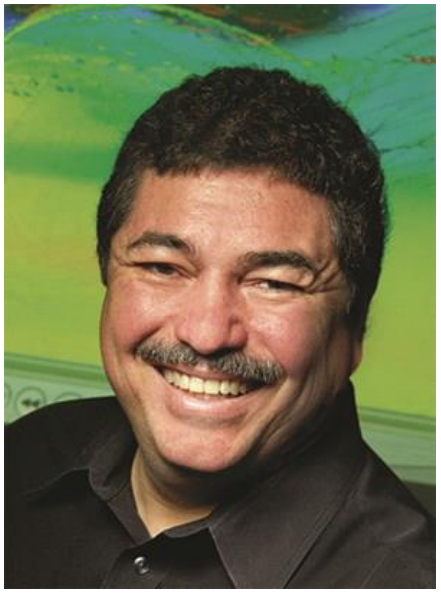
Predictability of the variable Solar-Terrestrial Coupling (2020-2024)

Detailed documentation is available at:
http://www.issibj.ac.cn/Publications/Forum_Reports/201404/W020190620592906717714.pdf

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

PRESTO chair and co-chairs

Co-chair
Katja Matthes
Germany

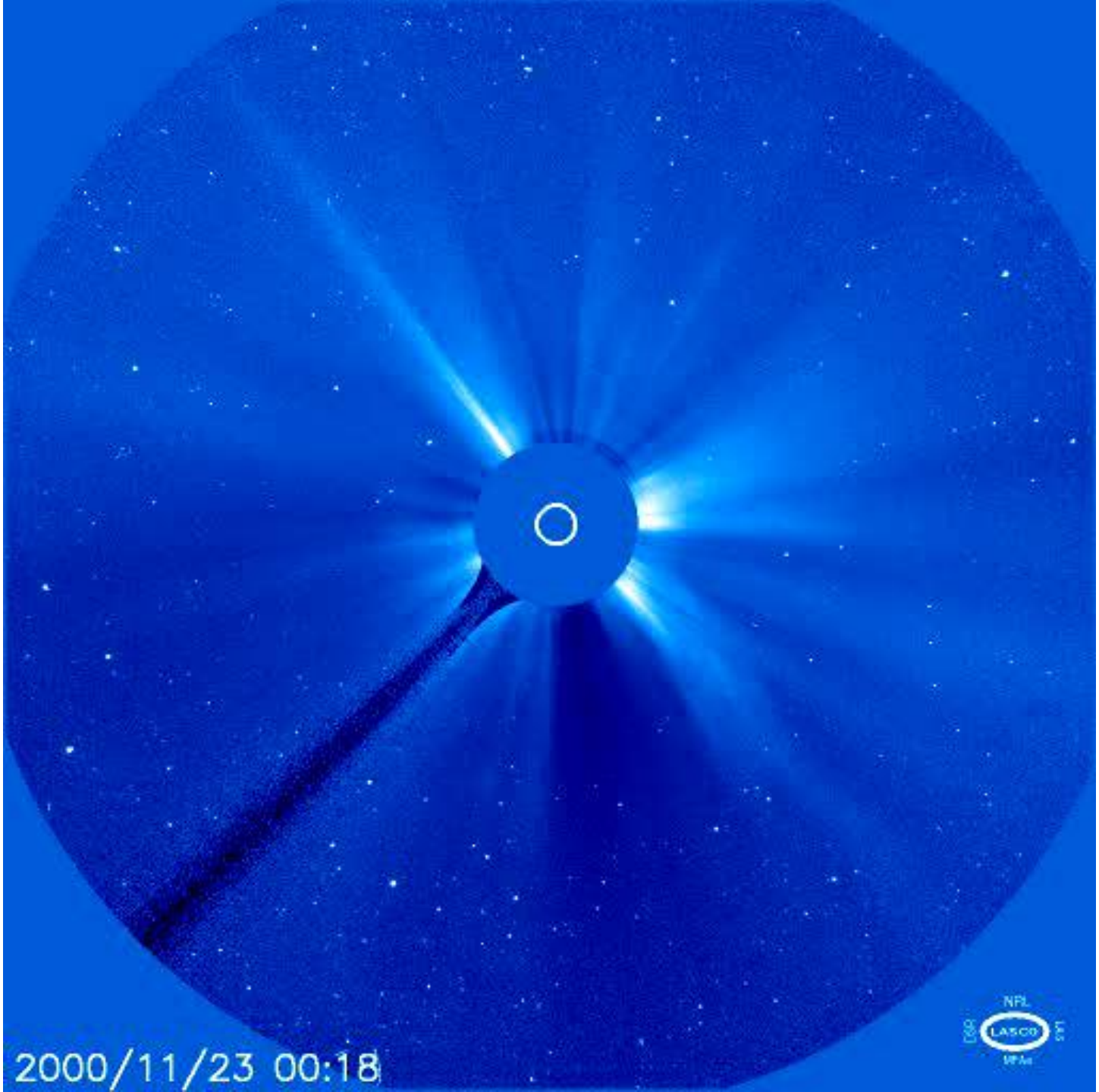


Chair
Ramon E. Lopez
USA

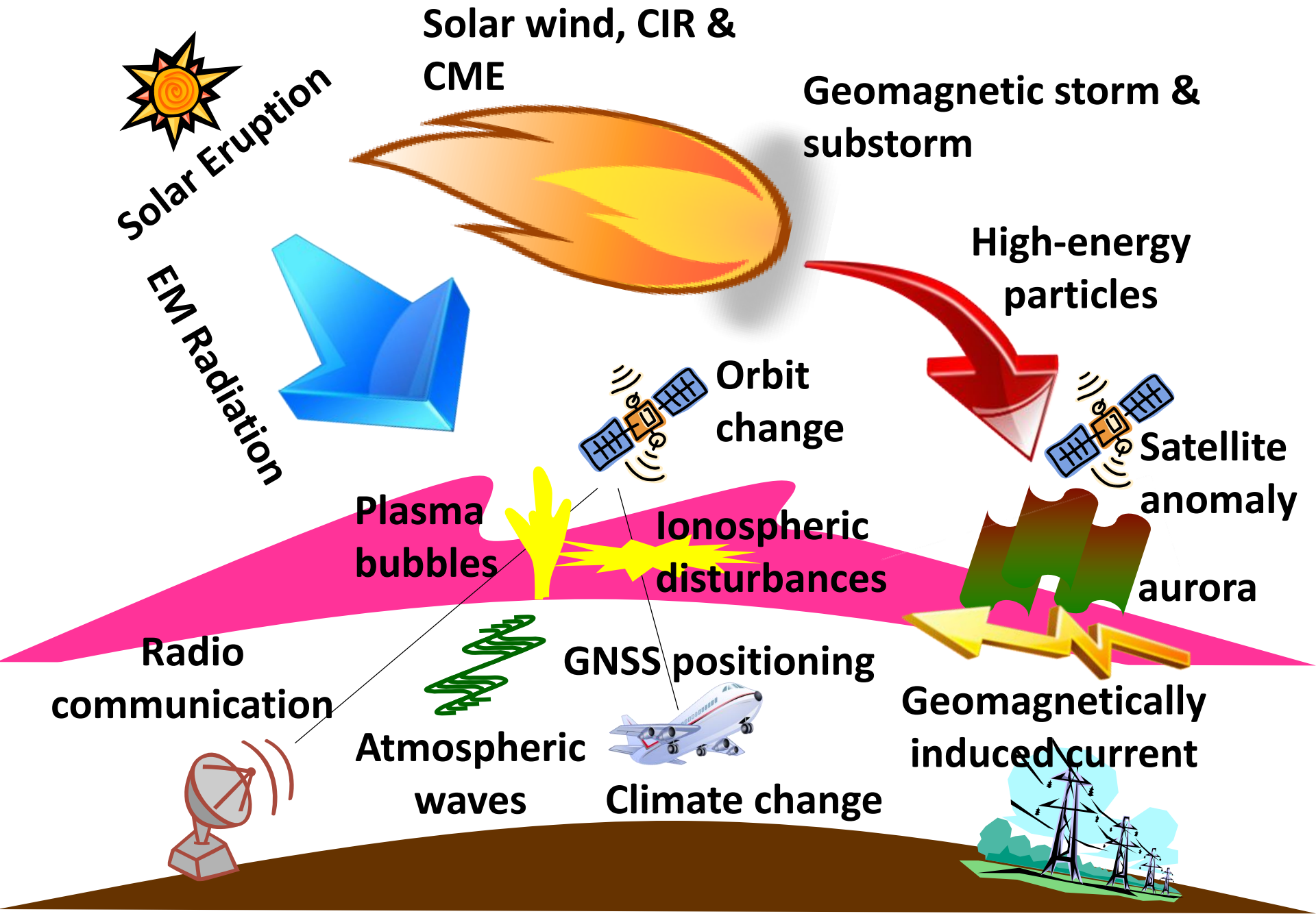
Co-chair
Jie Zhang
USA

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

Solar wind and Coronal Mass Ejections (CMEs) observed by the SOHO satellite



NASA
SOHO
LASCO


Solar wind, CIR & CME
Solar Eruption
Geomagnetic storm & substorm
EM Radiation
High-energy particles
Orbit change
Satellite anomaly
Plasma bubbles
Ionospheric disturbances
aurora
Radio communication
GNSS positioning
Geomagnetically induced current
Atmospheric waves
Climate change

Pillar 1. Sun, interplanetary space and geospace

Co-leaders of Pillar 1

Allison Jaynes
(USA)

Emilia Kilpua
(Finland)

Spiros Patsourakos
(Greece)

Pillar 2. Space weather and the Earth's atmosphere

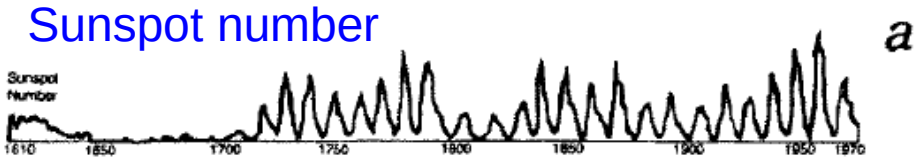
Co-leaders of Pillar 2

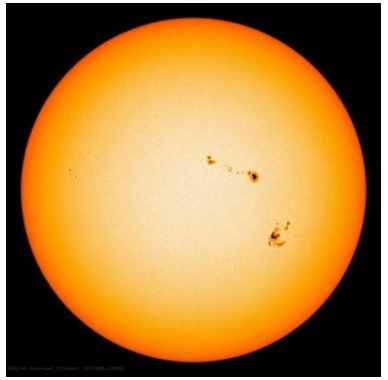
Loren C. Chang
(Taiwan)

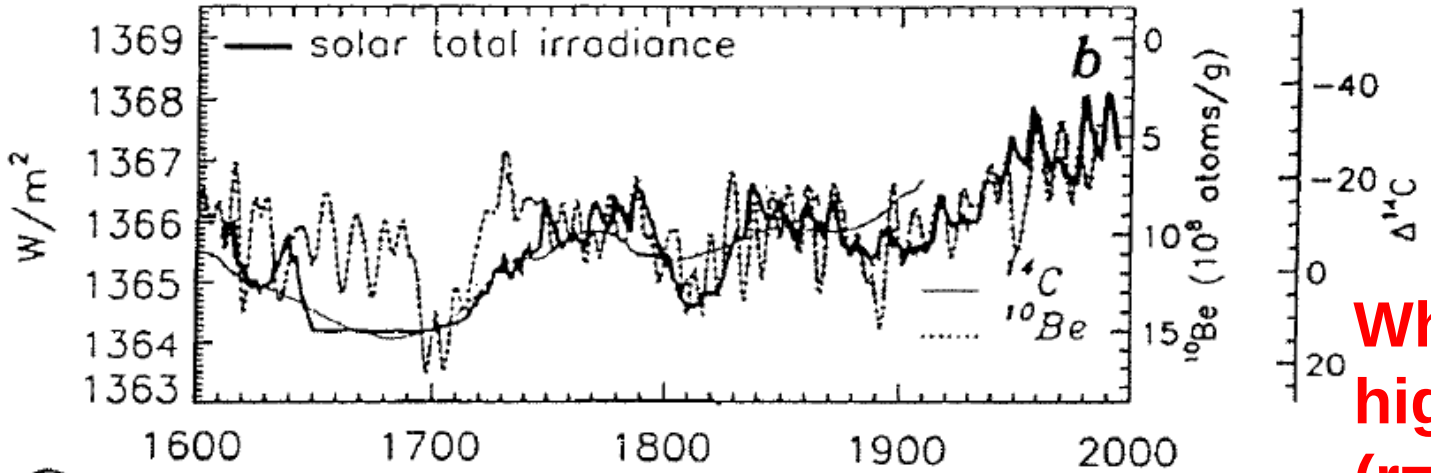
Duggirala
Pallamraju
(India)

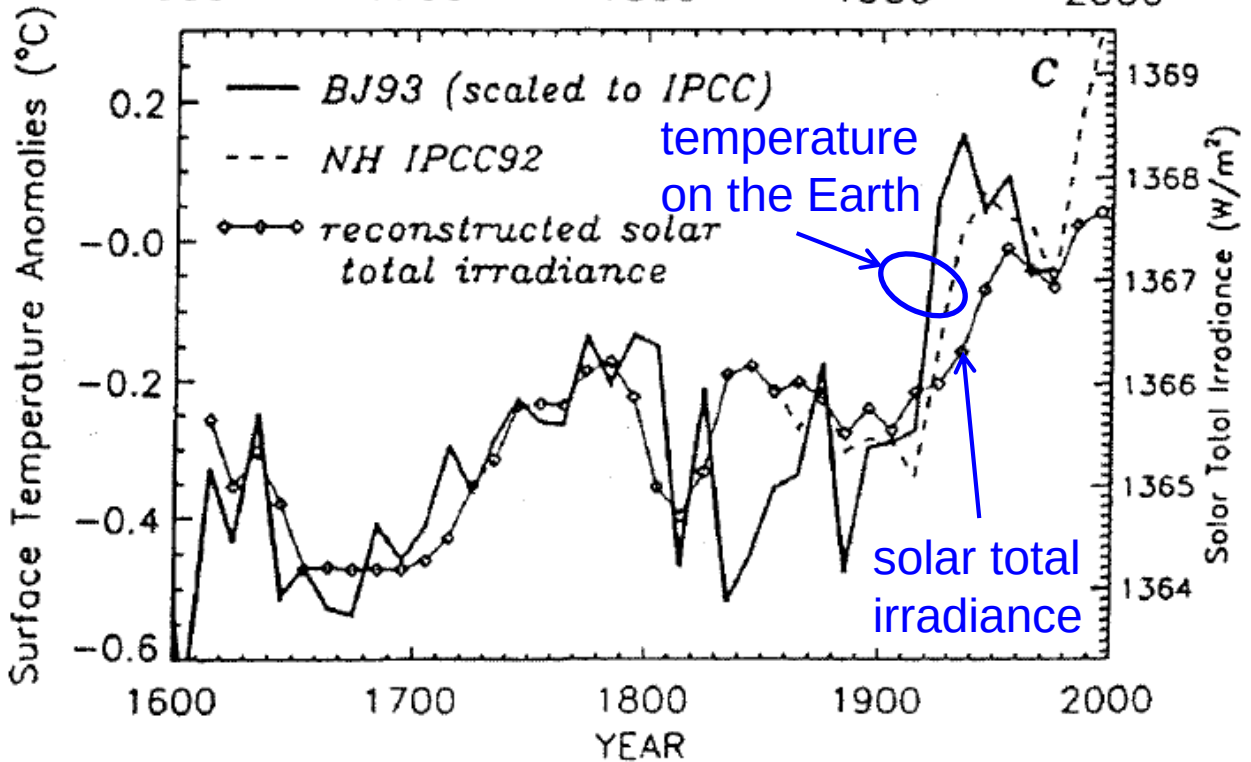
Nick M. Pedatella
(USA)

Sun-Climate Change



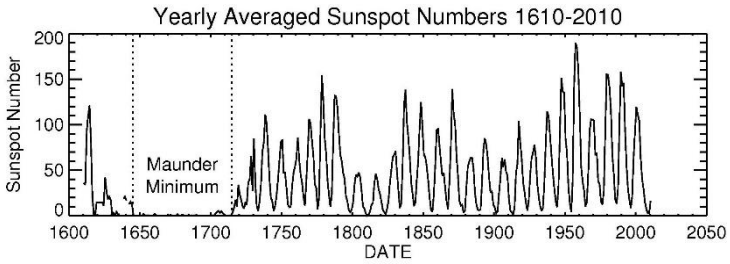


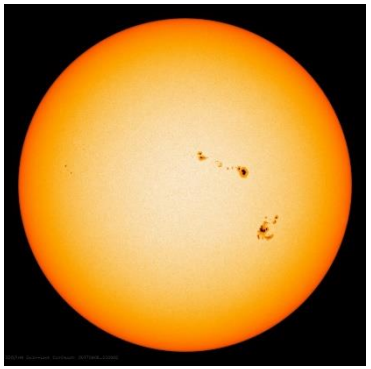




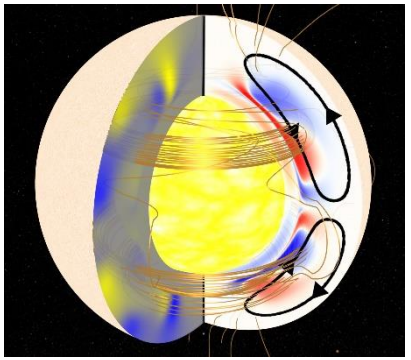
What makes this high correlation (r=0.86) between solar total irradiance and temperature on the Earth?

Lean (GRL, 1995) reproduced by Pang and Yau (EOS, No.43, 2002)





Solar dynamo



Interplanetary space

Magnetosphere

Solar energetic particles

magnetospheric particles

Ionosphere
Thermosphere

Mesosphere

Stratosphere

Troposphere

Total solar irradiance (TSI)

UV emission

Energetic particle precipitation

HOx
NOx

Ozone
Temperature

Chemical-dynamical coupling

Dynamical coupling

Atmospheric oscillations

Anthropogenic effects

Sea surface temperature variability

Modified from Gray et al. (2010)

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

Co-leaders of Pillar 3

Odele Coddington (USA)

Jie Jiang (China)

Eugene Rozanov (Switzerland)

Summary

- **PRESTO is the new SCOSTEP scientific program to run during 2020-2024**
- **Scientists from all over the world will 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

Backup Slides

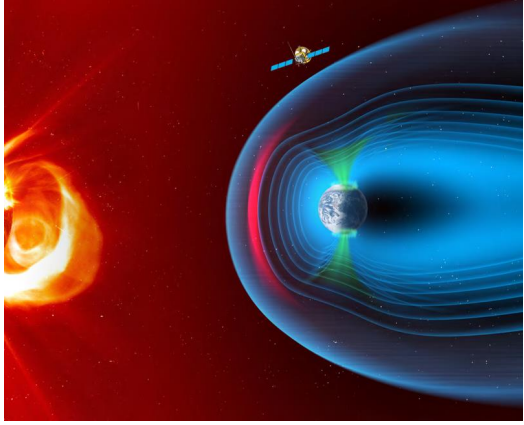
SCOSTEP

Scientific Committee on Solar-Terrestrial Physics

The Scientific Committee on Solar Terrestrial Physics (SCOSTEP) is a thematic organization of the International Science Council (ISC). SCOSTEP promotes ISC's vision to advance science as a global public good. SCOSTEP further endorses ISC's activities to promote international research and scholarship on key global challenges, and to support the continued and equal advancement of scientific rigor, creativity and relevance in all parts of the world.

SCOSTEP complements ISC's activities by running international interdisciplinary scientific programs and promoting solar-terrestrial physics research by providing the necessary scientific framework for international collaboration and dissemination of the derived scientific knowledge in collaboration with other ISC bodies. SCOSTEP is a permanent observer at the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS).

Pillar 1. Sun, interplanetary space and geospace



Q1.1 Under what conditions are solar eruptions, CMEs, and SEPs produced, and which indicators of pre-CME and pre-flare activity are reliable?

Q1.2 What are the required/critical model input parameters for most successfully forecasting the arrival of SEPs and the geoeffectiveness of CMEs, SIRs/CIRs and the consequences of the interactions between SIRs/ CIRs and CMEs?

Q1.3 How are different magnetospheric disturbances and waves (which are critical for the ring current and radiation belt dynamics) driven by variable solar wind structures, and/or internal magnetospheric processes?

Q1.4 How can we improve the predictability of geomagnetic storms, substorms and radiation hazards, which impact the space environment and technological infrastructures (in space and on the ground)?

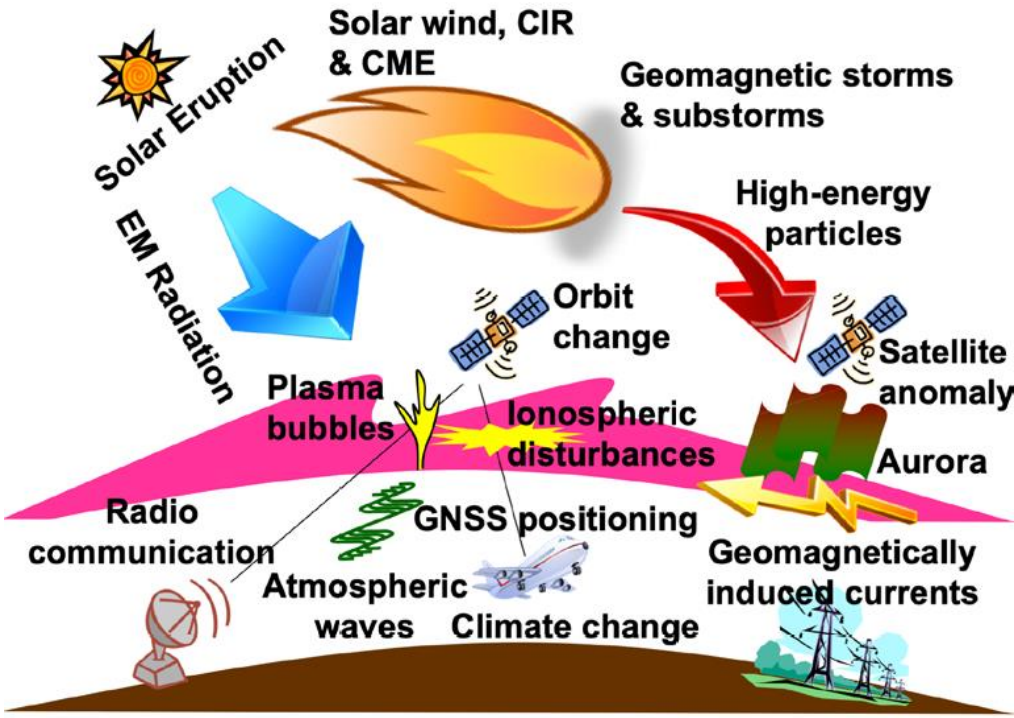
Pillar 2. Space weather and the Earth's atmosphere

Q2.1 How does the thermosphere and ionosphere respond to various forcings from above and from below?

Q2.2 How do atmospheric waves and composition changes impact the middle and upper atmosphere?

Q2.3 What is the magnitude and spectral characteristics of solar and magnetospheric forcing, needed for accurate predictions of the atmospheric response?

Q2.4 What is the chemical and dynamical response of the middle atmosphere to solar and magnetospheric forcing?



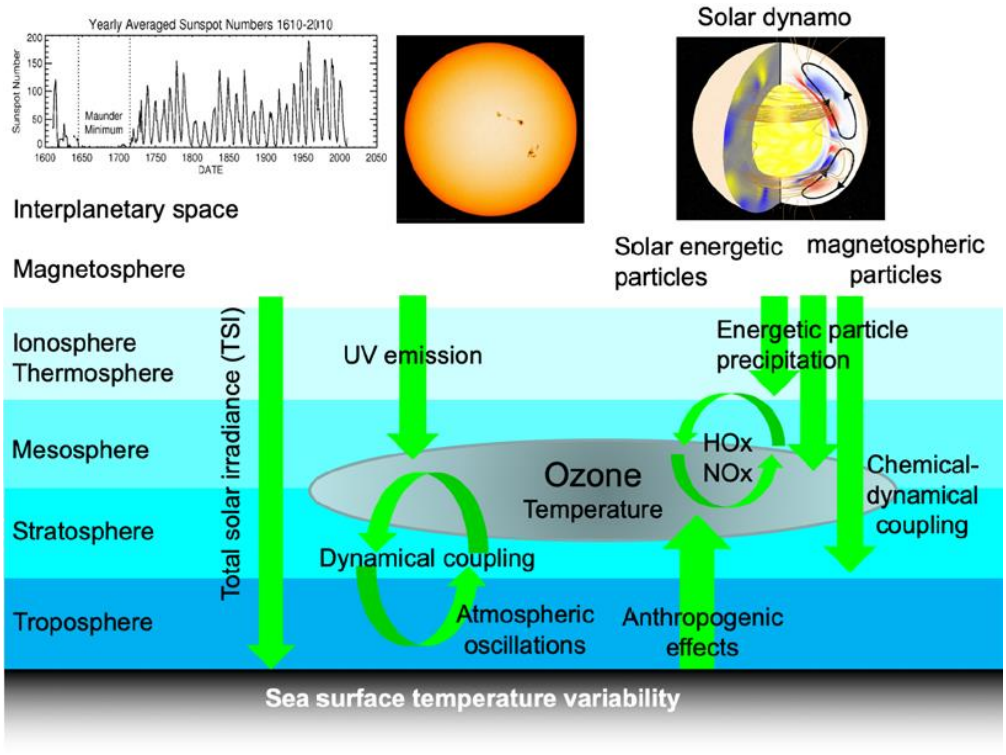
Pillar 3. Solar activity and its influence on the climate of the Earth System

Q3.1 How will future solar activity vary over timescales relevant for the forcing of the Earth's climate and atmospheric dynamics?

Q3.2 What is the role of coupling between atmospheric regions in the realization of the long-term solar influence on the Earth system?

Q3.3 How is the atmospheric response to the variable solar forcing affected by, and interacts with, increasing greenhouse concentrations?

Q3.4 How can solar activity predictions be used to improve atmospheric prediction on sub-seasonal to decadal timescales?



An integrated view of solar-terrestrial prediction

Overlap of various Solar-Terrestrial phenomena with various spatial & temporal scales