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

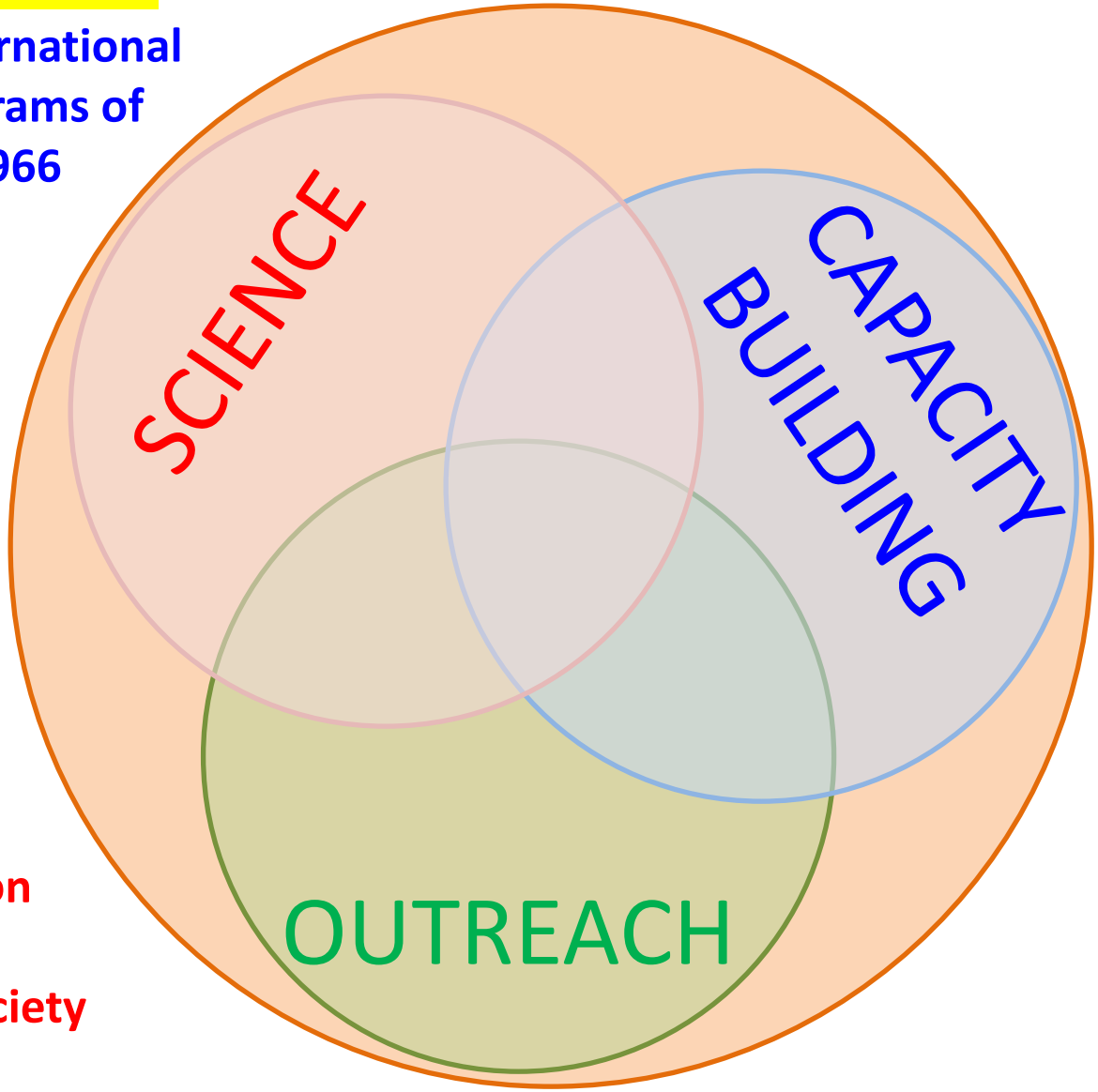
SCOSTEP
Scientific Committee on Solar-Terrestrial Physics

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

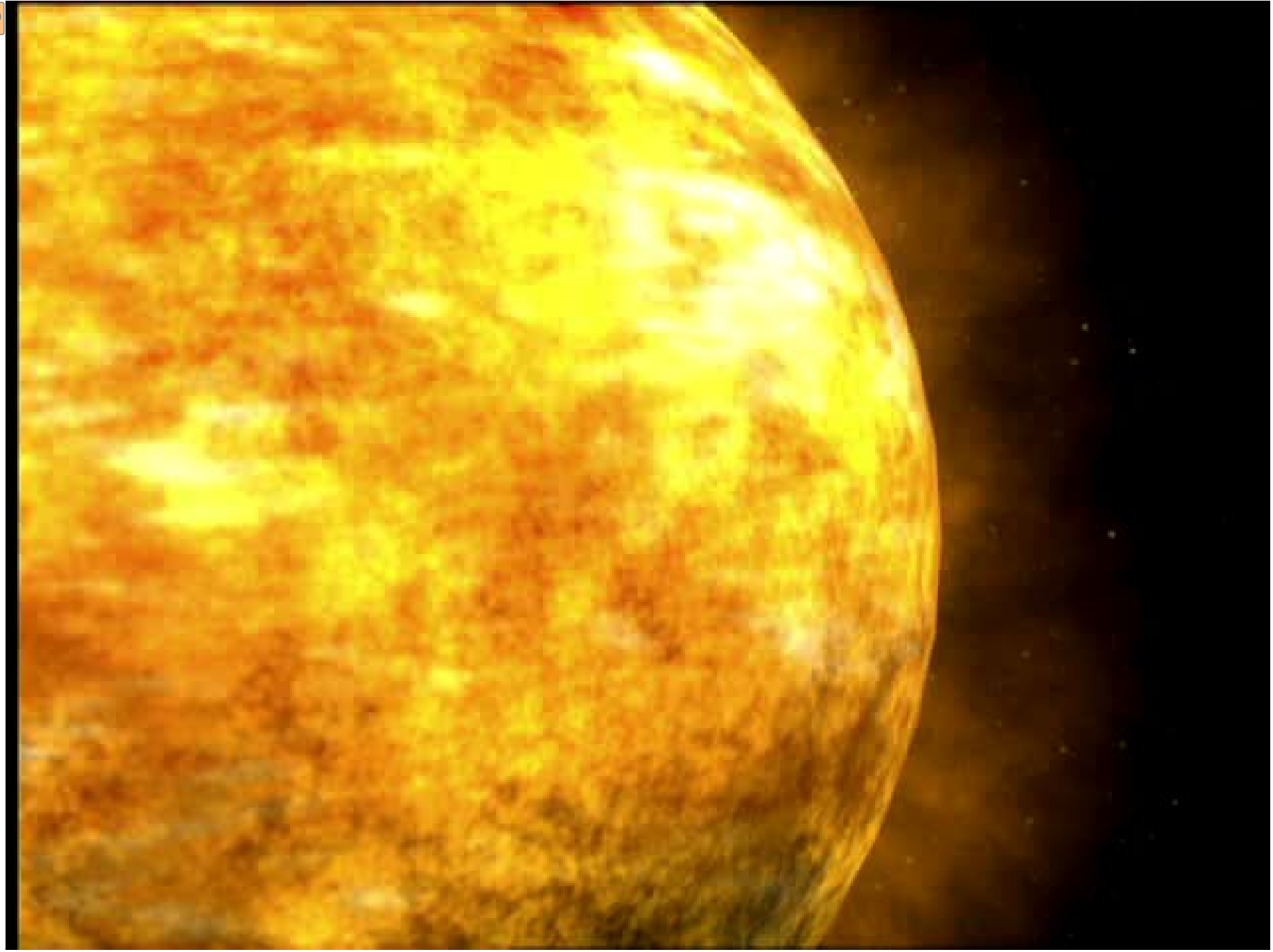
Disseminates new knowledge on the Sun-Earth System and how the Sun affects life and society as outreach activities



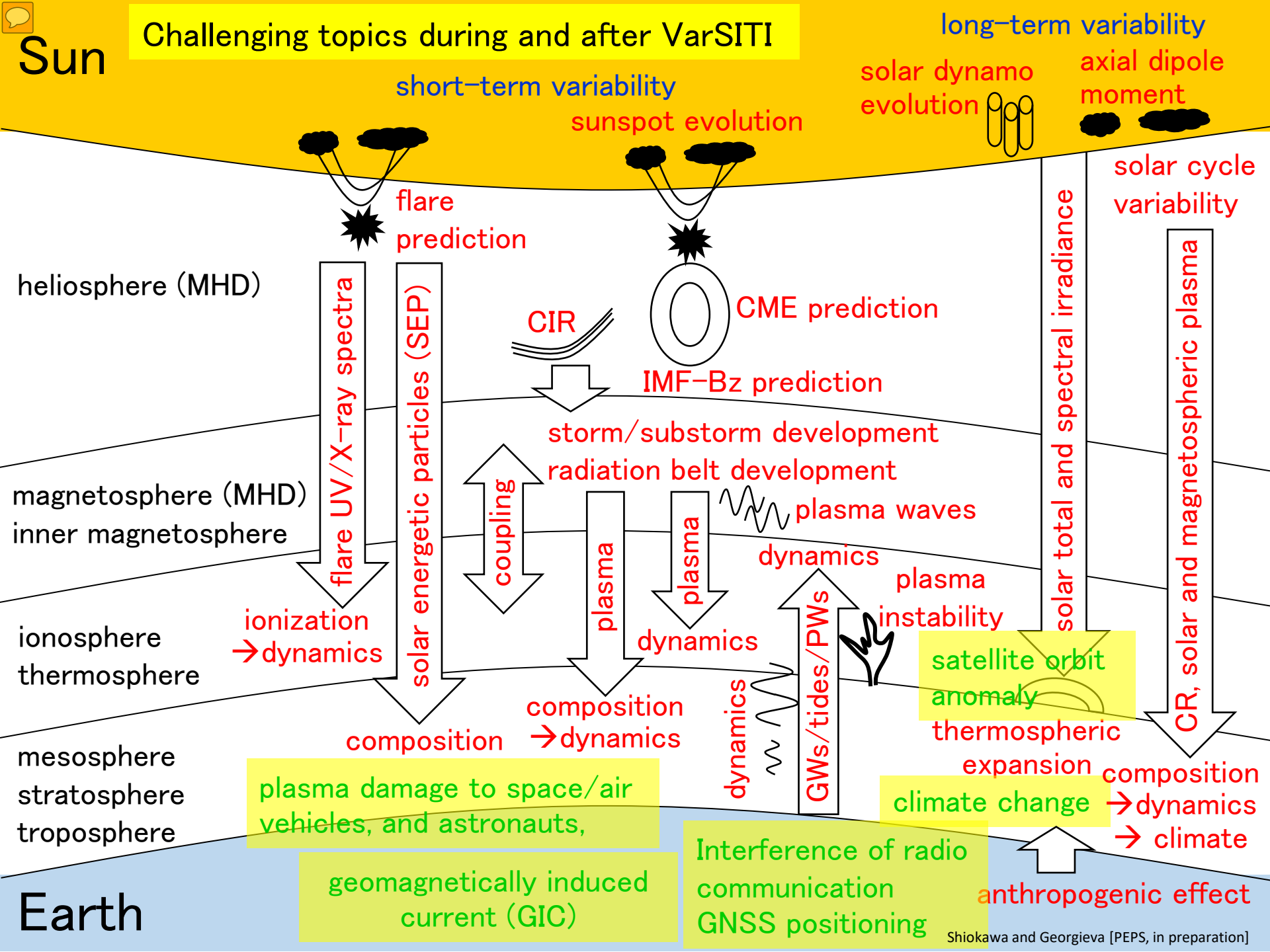
SCOSTEP
Scientific Committee on Solar-Terrestrial Physics

Current Member Countries and Geographical Regions of SCOSTEP

Australia
Austria
Brazil
Bulgaria
Canada
China
Czech Republic
Finland
France
Georgia
Germany
Hungary
India
Indonesia
Israel
Japan
Kenya
Mexico
New Zealand
Nigeria
Norway
Russia
South Korea
Slovakia
South Africa
Switzerland
Taiwan
United Kingdom
USA



NASA schematic images


Challenging topics during and after VarSITI
Sun
long-term variability
solar dynamo evolution
axial dipole moment
short-term variability
sunspot evolution
solar cycle variability
flare prediction
heliosphere (MHD)
flare UV/X-ray spectra
solar energetic particles (SEP)
CIR
CME prediction
IMF-Bz prediction
solar total and spectral irradiance
CR, solar and magnetospheric plasma
storm/substorm development
radiation belt development
magnetosphere (MHD)
inner magnetosphere
coupling
plasma waves
plasma
plasma
dynamics
plasma instability
ionosphere
thermosphere
ionization →dynamics
dynamics
satellite orbit anomaly
GWs/tides/PWs
dynamics
composition →dynamics
composition
thermospheric expansion
mesosphere
stratosphere
troposphere
plasma damage to space/air vehicles, and astronauts,
climate change
composition →dynamics → climate
Interference of radio communication GNSS positioning
anthropogenic effect
geomagnetically induced current (GIC)
Earth
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:

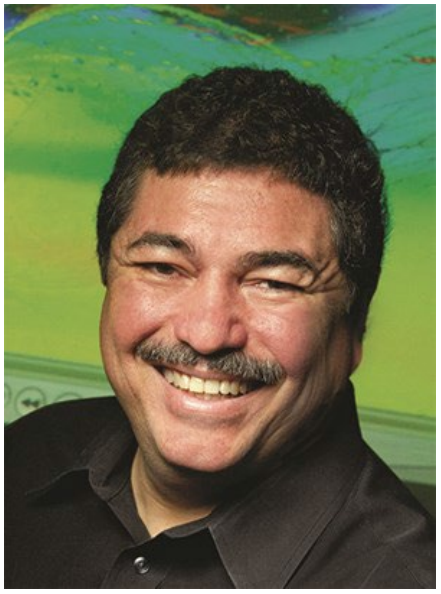
Predictability of the variable Solar-Terrestrial Coupling (2020-2024)

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

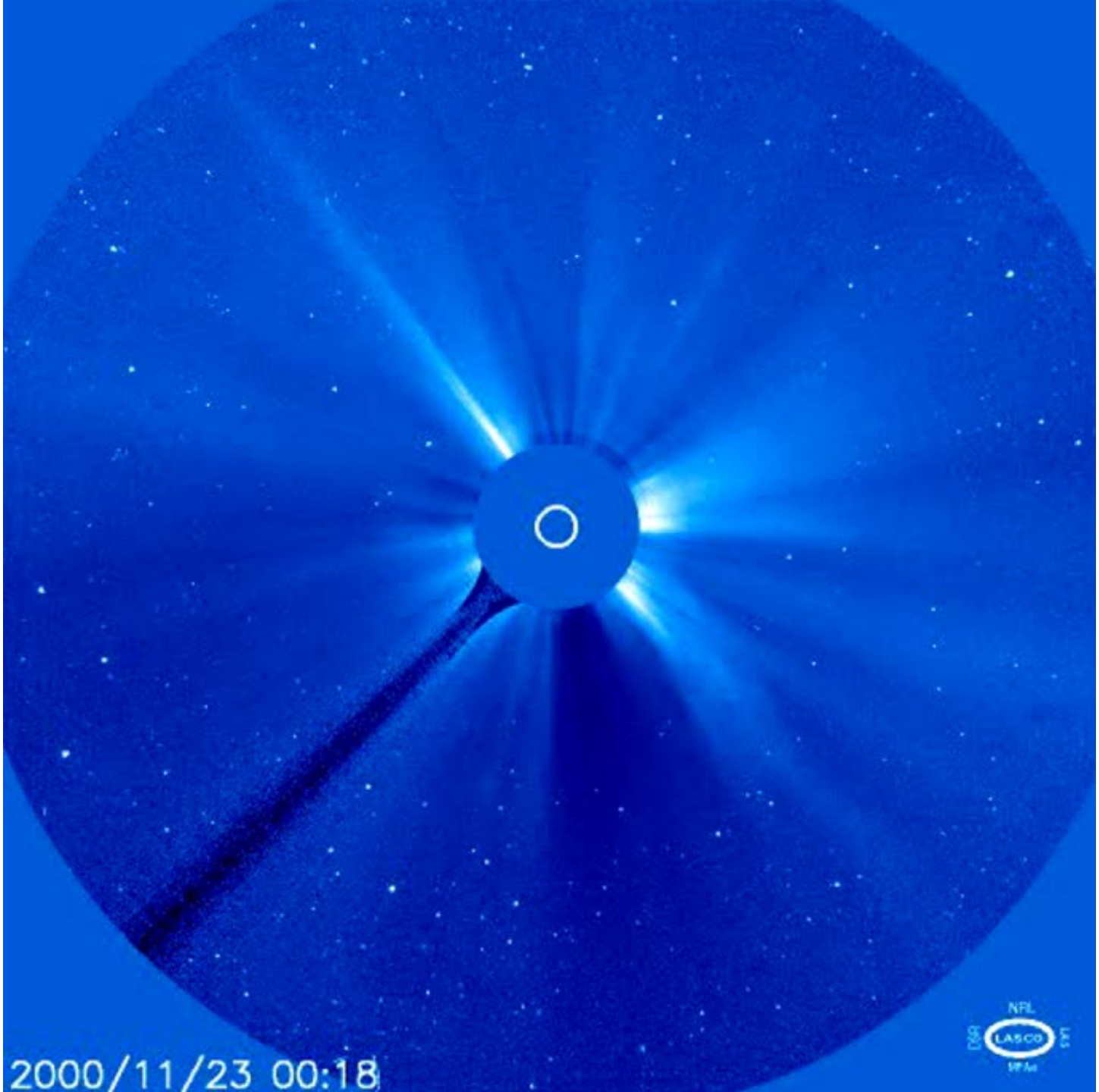


Chair
Ramon E. Lopez
USA

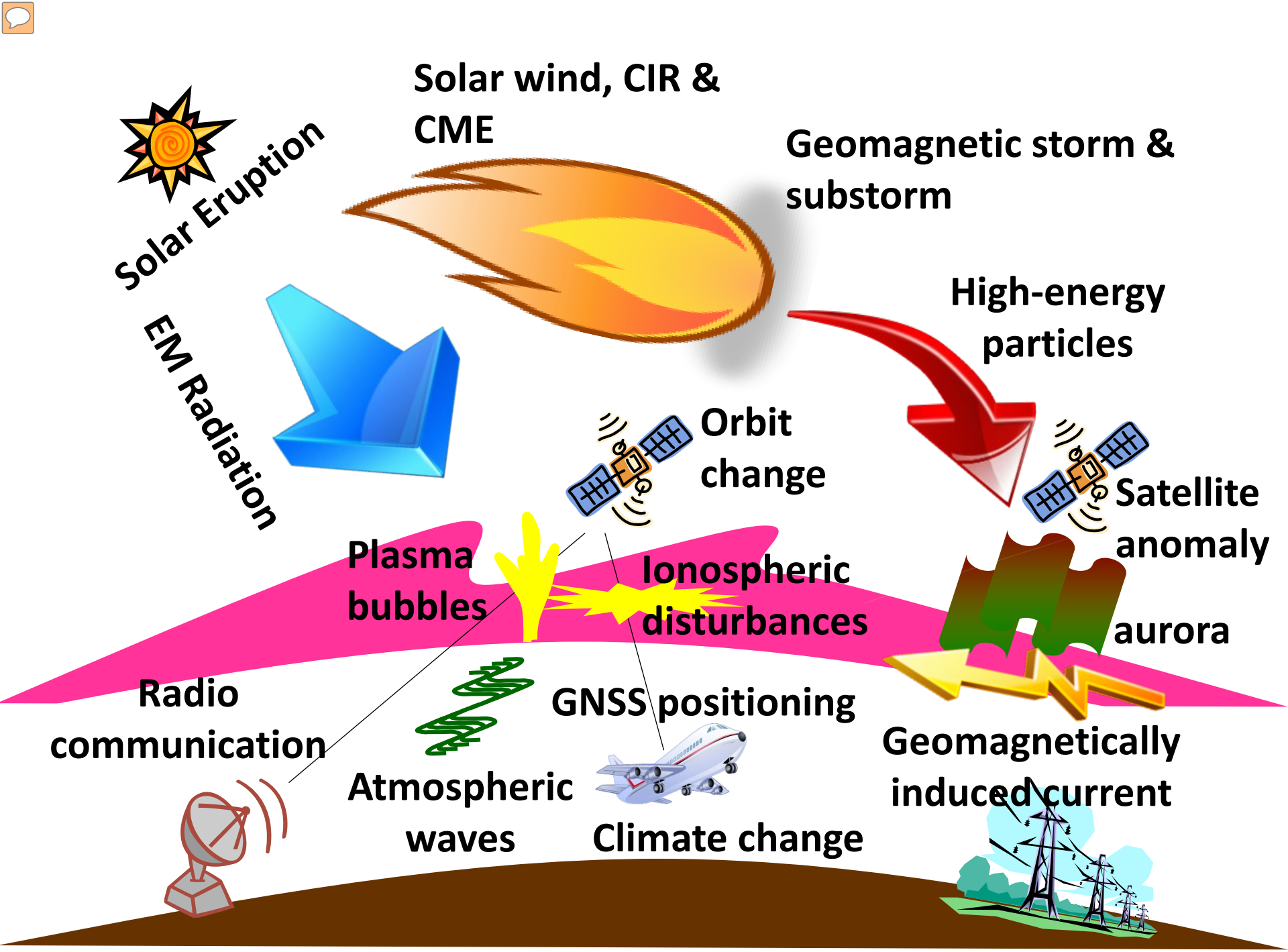
Co-chair
Jie Zhang
USA

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

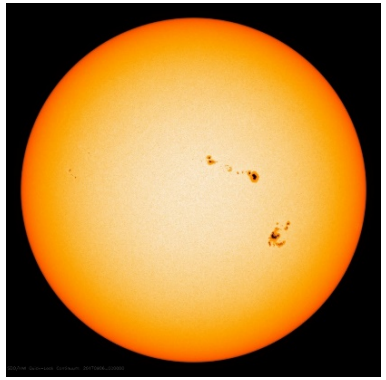
Co-leaders of Pillar 2

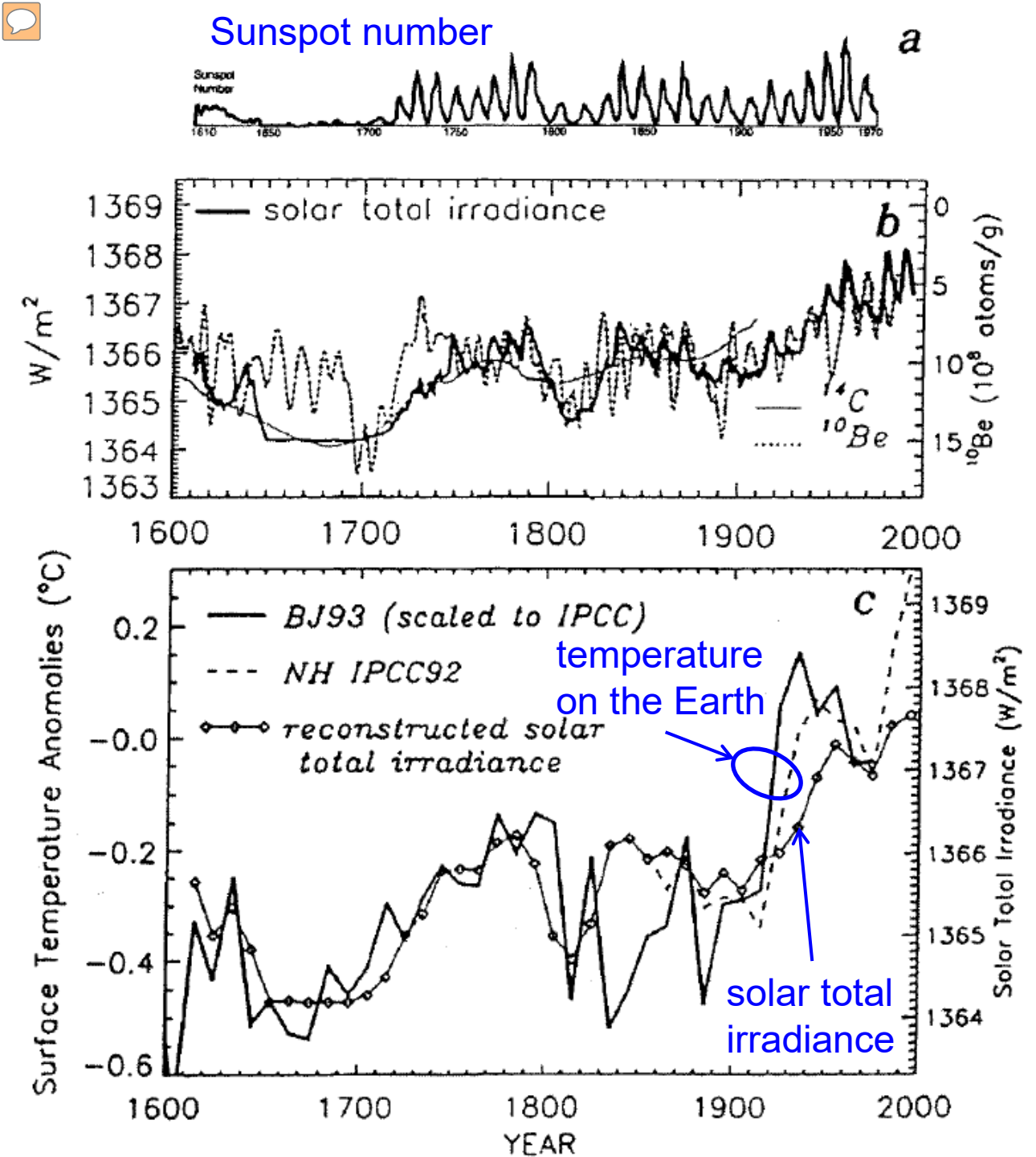
Loren C. Chang
(Taiwan)

Duggirala
Pallamraju
(India)

Nick M. Pedatella
(USA)

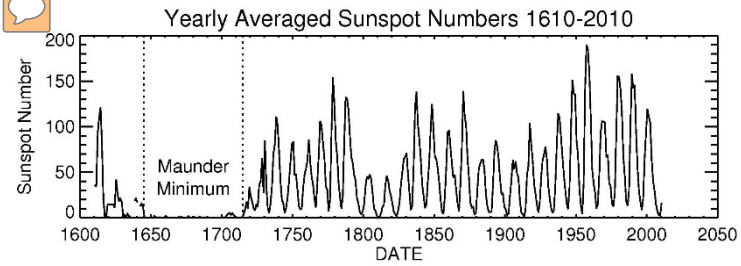
Sun-Climate Change

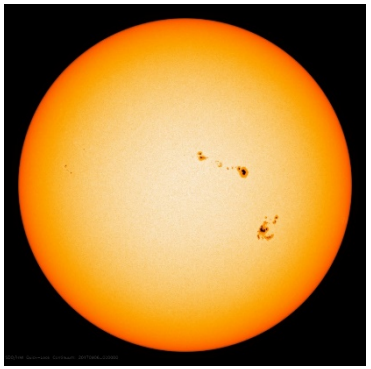




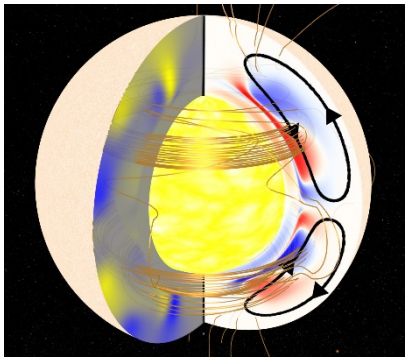
What makes this high correlation (r=0.86) between solar total irradiance and temperature on the Earth?

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**

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SCOSTEP: Scientific Committee on Solar-Terrestrial Physics