



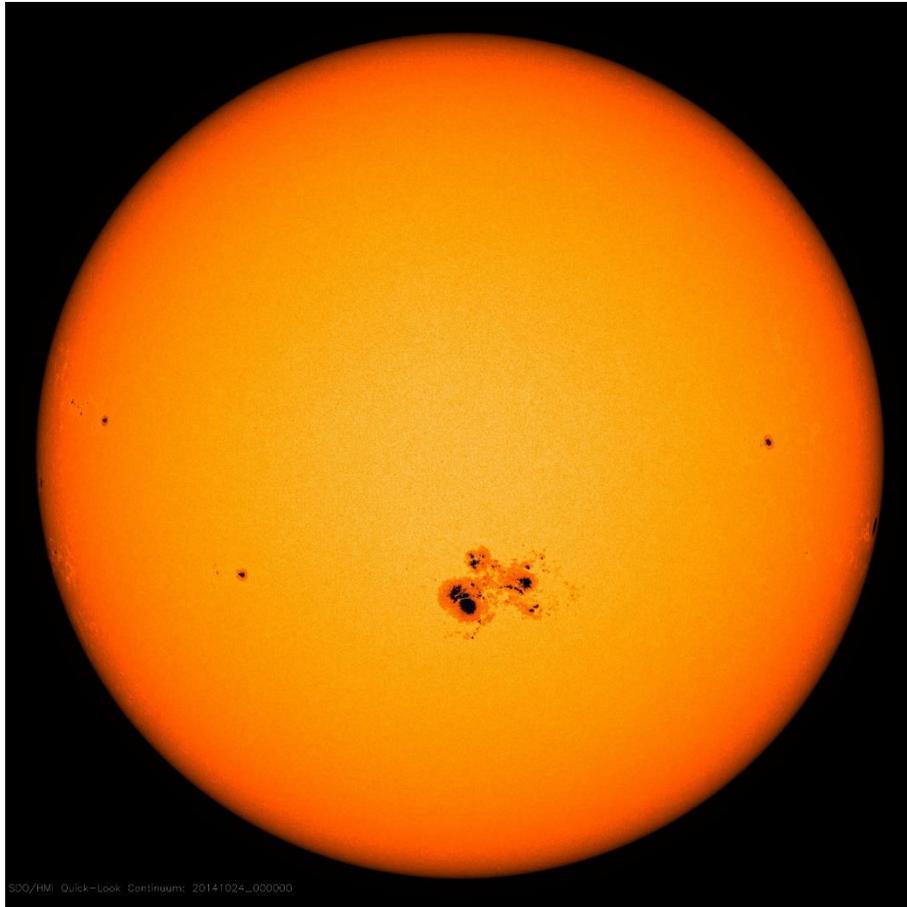
The Next Scientific Program of SCOSTEP: 2019-2023

Nat Gopalswamy
President, SCOSTEP

Technical Presentation to UNCOPUOS/STSC Agenda item 10. Space Weather

Sun-Earth Connection

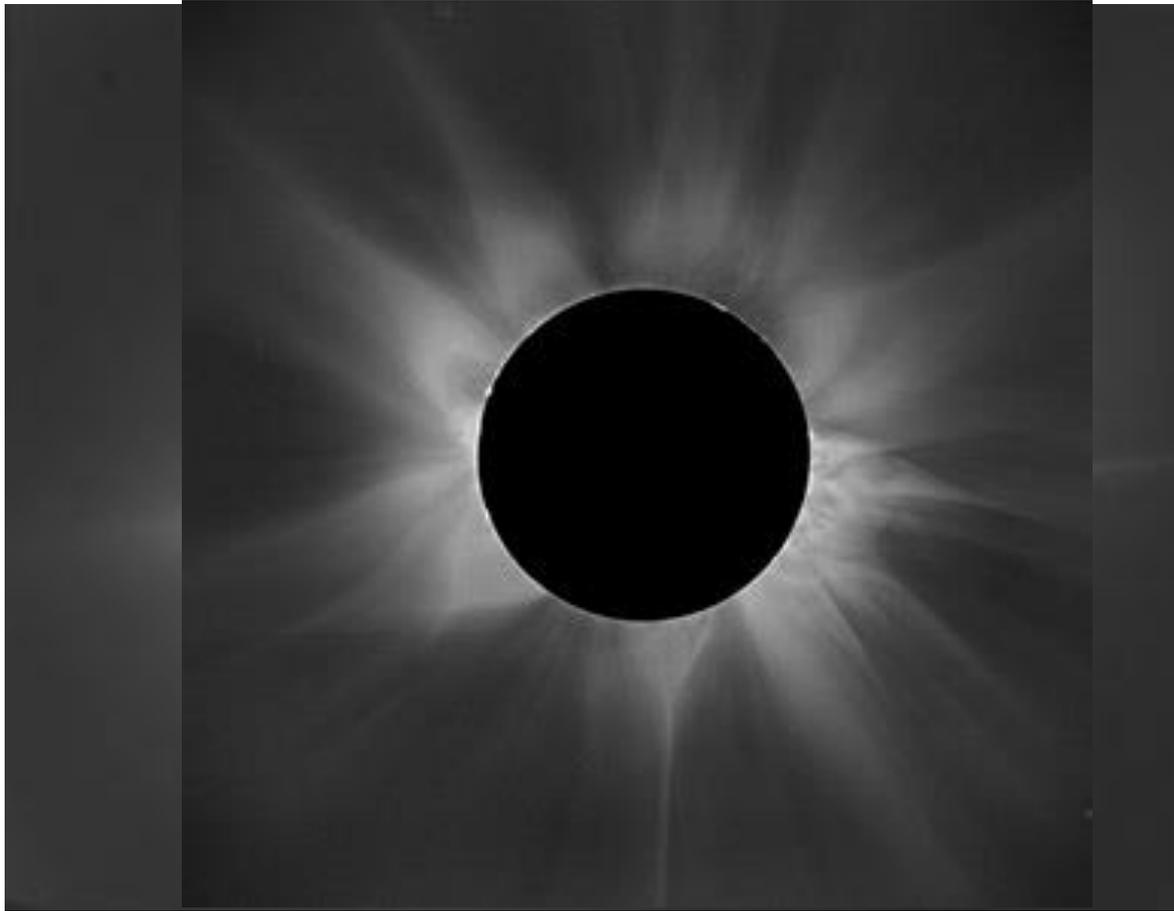
When we look at the Sun, we think of it as the benevolent object in the sky that supports life on Earth



But there is another side to the Sun – the dark side – in the form of sunspots and the associated magnetic field that not only affects the amount of light we receive, but also causes severe space weather; the space weather that affects human technology on Earth and in space

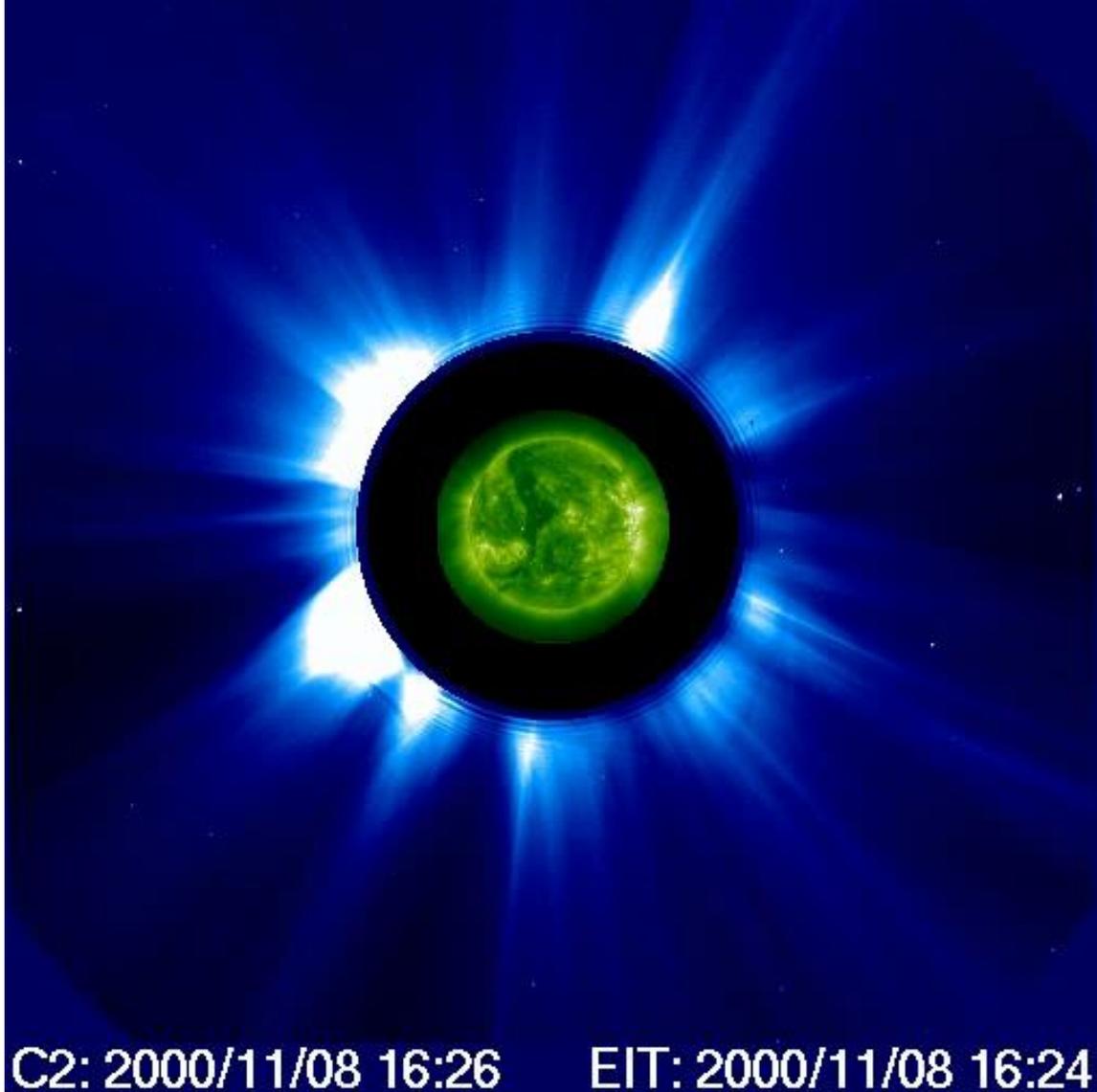
Sun-Earth Connection

During a solar eclipse, we see that the Sun's atmosphere is complex, structured by its magnetic field

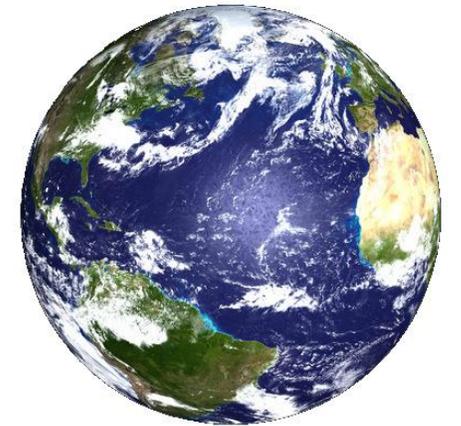


The structure can dramatically change when there are more spots. Each one of these structures can explode, sending plasma and magnetic fields into the surrounding space

Solar Storms



When we monitor the Sun with telescopes known as coronagraphs that produce artificial eclipses, we can see the coronal structures explode and send out what are known as coronal mass ejections

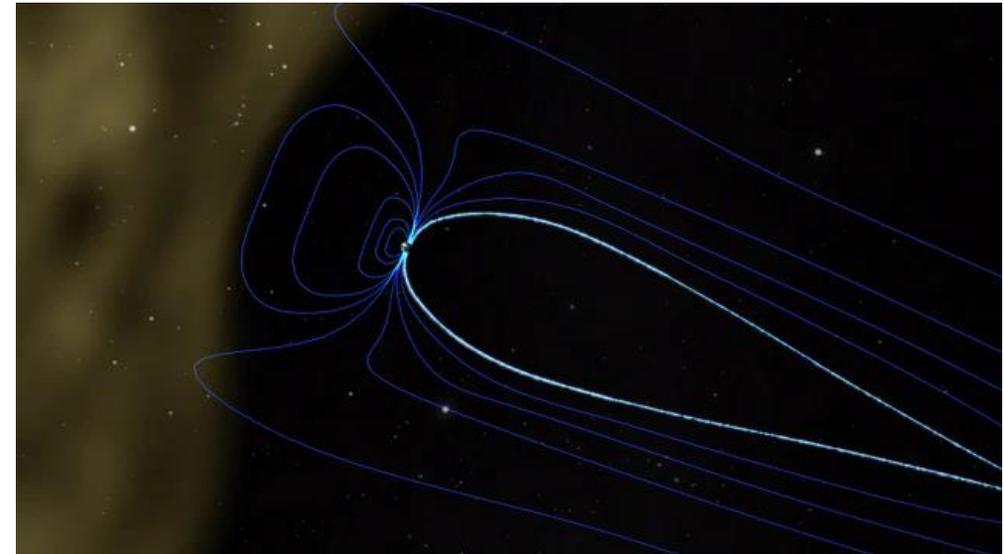
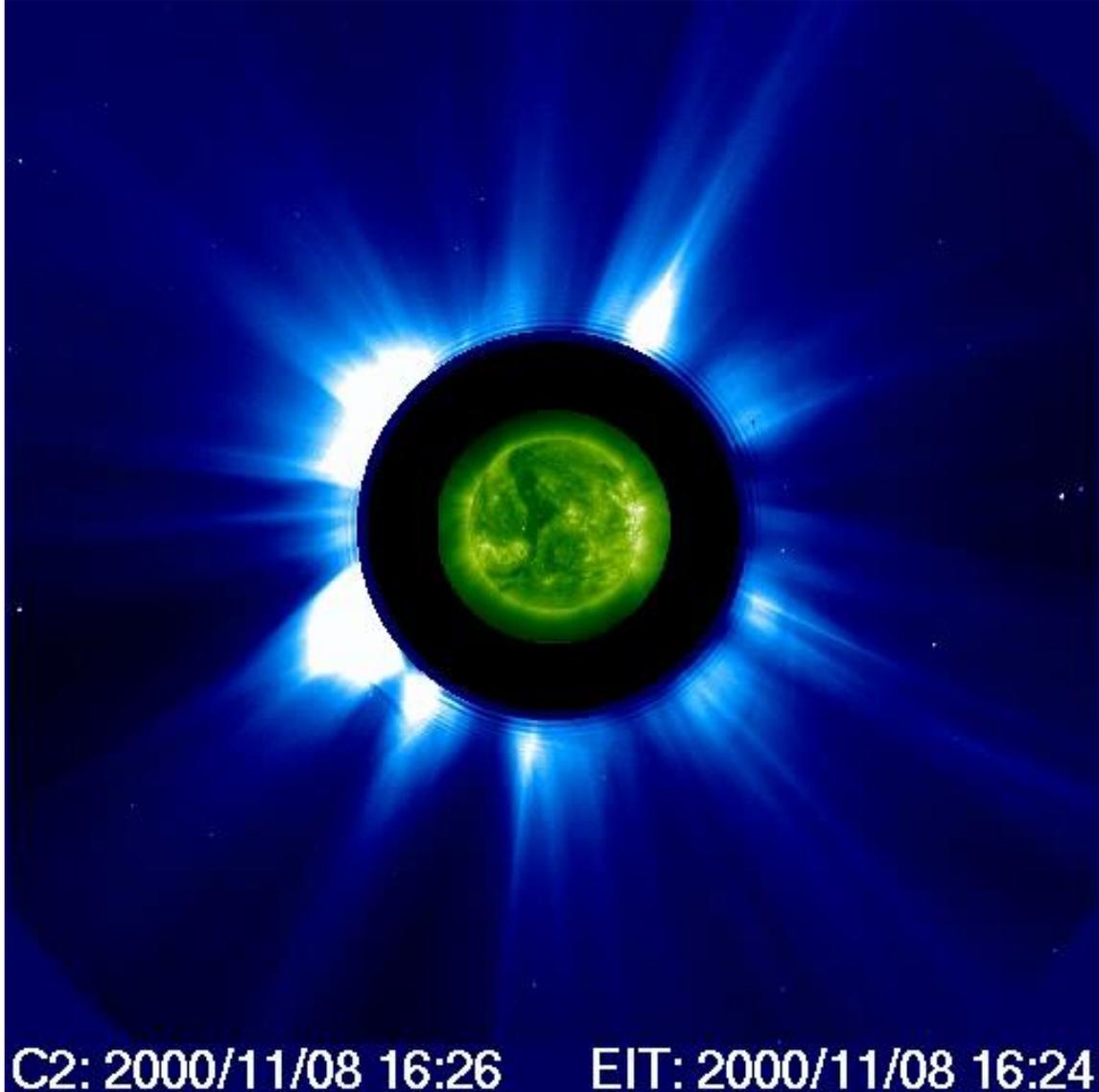


When Earth or a spacecraft can face adverse conditions when in the path of these solar storms

Credit: ESA/NASA

Earth's Magnetic Field Affected by Solar Storms

Earth's magnetic field generally protects us from harmful particle radiation from the Sun or cosmic rays



But it can undergo violent changes when a solar storm hits – produce currents and accelerating charged particles – the geomagnetic storm in the region where our satellites reside



Credit: ABC Weather Kate Doyle

SCOSTEP scientific programs deal with this complex interaction between Sun and Earth

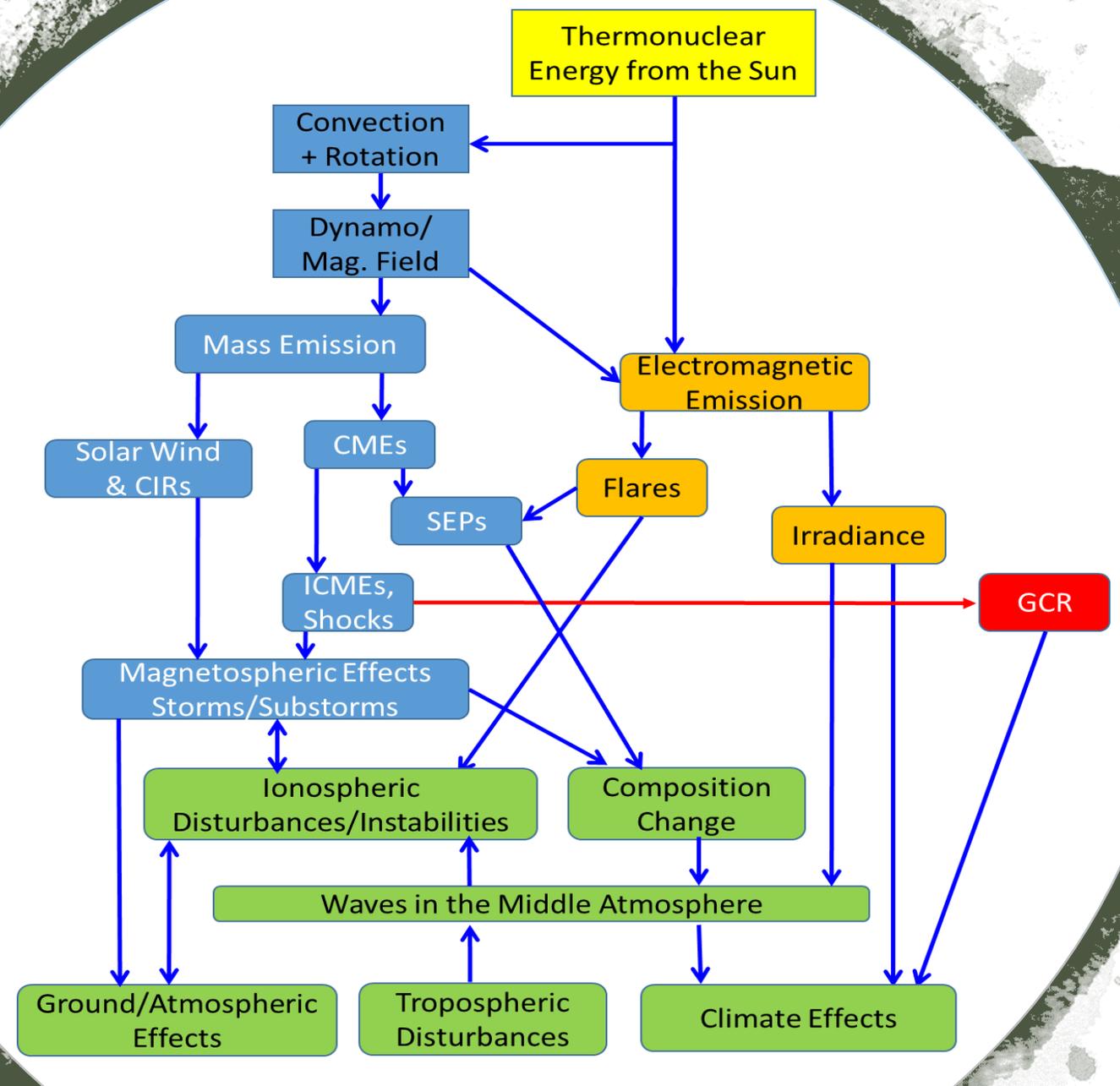
The programs are mandated by the International Science Council and participated by all major scientific unions involved in astronomical, solar, space, and geosciences

The programs need to be international, interdisciplinary, and doable over a timescale of 4-5 years

More than a thousand scientists typically participate

Understanding

CAUSES
VarSITI



Prediction

PRESTO:
Predictability of
the Variable
Solar-Terrestrial
Coupling

Four Channels of Energy Flow

PRESTO: AIMS, SCOPE AND GOALS

PRESTO will address predictability of

- 1) space weather on timescales** from seconds to days and months, including processes at the Sun, in the heliosphere and in the Earth's magnetosphere, ionosphere and atmosphere
- 2) sub-seasonal to decadal and centennial variability** of the Sun-Earth system, with a special focus on climate impacts => link to the World Climate Research Program Grand Challenge on Near-Term Climate Predictions and IPCC assessments.

Timeline



- January 2018: Next SCOSTEP Program (NSP) Committee formed
- January to November 2018: Committee received input from the world science community
- November 14-16, 2018: International Space Science Institute (ISSI) hosted a Forum to discuss the NSP
- December 2018 – February 2019: further discussion of the NSP plan
- February 25-27, 2019: ISSI Forum in Bern
- March 2019: Submission of final report to SCOSTEP Bureau
- August 2019: PRESTO Launch

The End

An integrated view of solar-terrestrial prediction

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

