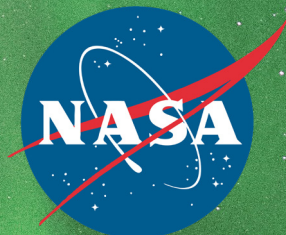


# Eddy Symposium Working Group

## Interconnection: Sun, Climate, Society

March 2024



UCAR  
COMMUNITY  
PROGRAMS

 CPAESS  
Cooperative Programs for the  
Advancement of Earth System Science

# Interconnection: Sun, Climate, Society

*by Greg Kopp and Sun, Climate, and Society Working Group*

*The Sun provides nearly all the energy driving the Earth's climate system.* The total solar irradiance (TSI) is a measure of this solar energy incident at the top of the Earth's atmosphere. These measurements provide 99.974 % of the net energy powering the Earth's climate. They are the most accurate and most stable of all Earth-energy-balance (EEB) measurements, with accuracies near 0.015 % and stabilities of  $\sim 0.001 \text{ \% yr}^{-1}$ , levels which are necessary to detect climate-relevant solar variability. Researchers currently have an uninterrupted 45-year TSI-measurement record from spaceborne instruments. Spectral solar irradiance (SSI) measurements complement the TSI by indicating the wavelength dependence of that net energy, which determines where it is deposited in the Earth's climate system. Such spectral irradiances are needed for global-circulation and global-climate models.

*Natural influences on climate need to be discriminated from anthropogenic causes.* In determining the human-caused effects on climate and setting regulating policies to control change, natural influences, including solar variability, volcanic eruptions, and ocean-atmosphere oscillation modes such as El Nino, need to be discriminated to know the portion of climate change that may be regulated. Thus, solar-variability measurements need to be continued and climate-modeling efforts involving solar influences need to be refined.

*Sun-climate research is a cross-disciplinary field that involves nearly everyone.*

Who's Involved in Cross-Disiplinary Sun/Climate?

- Science
  - Spacecraft and ground-based instrument builders and data analysts
  - Climate and solar modelers
  - Ocean and land monitoring networks: permafrost, cryosphere, land, oceans

- Long-term observers (sunspots, temperatures, rainfall, river levels, fires, winds, CO<sub>2</sub> & GHGs)
- Stellar-variability researchers
- History buffs, archeologists, geologists, geophysicists, dendrochronologists
- Name: Taiwo Osanyin; Solar Physicists, Atmospheric Scientists, Astrophysicists
- Society
  - Policy makers
  - All nations
  - IPCC
  - Media
  - You!!!

*The proposed Sun-Climate Data Institute (SCDI) will help integrate solar-variability measurements with climate models.* Establishing a central repository of vetted solar-variability data records will better enable the use of solar influences in Earth-climate models and make model intercomparisons such as CMIP more consistent.