



TSIS-1 and Continuity of the Total and Spectral Solar Irradiance Climate Data Record

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Radiative energy from the Sun establishes the basic climate of the Earth's surface and atmosphere and defines the terrestrial environment that supports all life on the planet. External solar variability on a wide range of scales ubiquitously affects the Earth system, and combines with internal forcings, including anthropogenic changes in greenhouse gases and aerosols, and natural modes such as ENSO, and volcanic forcing, to define past, present, and future climates. Understanding these effects requires continuous measurements of total and spectrally resolved solar irradiance that meet the stringent requirements of climate-quality accuracy and stability over time.

The current uninterrupted 39-year total solar irradiance (TSI) climate data record is the result of several overlapping instruments flown on different missions. Measurement continuity, required to link successive instruments to the existing data record to discern long-term trends makes this important climate data record susceptible to loss in the event of a gap in measurements. While improvements in future instrument accuracy will reduce the risk of a gap, the 2017 launch of The Total and Spectral Solar Irradiance Sensor (TSIS-1) ensures continuity of the total solar irradiance record into the next decade. Establishing a record of solar spectral irradiance (SSI) presents its own unique challenges. It is anticipated that the TSIS-1 SSI measurements will have lower uncertainty due lessons learned from previous missions.

This talk will summarize the importance of highly accurate and stable observations of solar irradiance for understanding the present climate epoch and for predicting future climate; why continuity in the solar irradiance data record is required; improvements in the TSIS Total and Spectral Irradiance Monitors, including verification of their calibration using ground-based NIST-traceable cryogenic standards; and how these improvements will impact Sun-climate studies in the near future.