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The NOAA/NCEI Solar Irradiance Climate Data Record, Version 3

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Incoming solar irradiance establishes Earth's surface and atmospheric temperature, driving coupled radiative, dynamical, and chemical processes that produce myriad land, ocean, and atmospheric interactions. The Sun' s irradiance is spectrally dependent, as is its variability, on time scales from days to centuries and longer. A fundamental quantity for Earth's energy and climate studies, solar spectral irradiance must be reliably specified on multiple time scales. As well, solar irradiance "reference"spectra with high-accuracy and high spectral resolution for certain levels of solar activity, are important inputs for multiple Earth science applications, including retrievals of aerosols and trace gases, converting satellite observed reflectance to radiance and vice versa, and for solar irradiance modeling.

Improvements in knowledge of total and spectral solar irradiance variability, acquired at higher accuracy and precision by the Total and Spectral Solar Irradiance Sensor (TSIS-1) and Compact Total Irradiance Monitor (CTIM) missions relative to predecessor missions, have been translated into Version 3 of the operational NOAA/NCEI Solar Irradiance Climate Data Record (CDR). The CDR V3 is prescribed by Version 1 of the NASA NOAA LASP (NNL) solar variability models for total solar irradiance (TSI) and solar spectral irradiance (SSI). The NNLTSI1 and NNLSSI1 models hold heritage from the Naval Research Laboratory (NRL) models. The CDR V3 daily- and monthly-averaged data records span from 1874 to present, and the yearly-averaged data record spans from 1610 to present. The CDR V3 prescribes the solar forcing dataset of the 7th Coupled Model Intercomparison Project.

The CDR V3 replaces the CDR V2, which became operational in 2015 and was based on Version 2 of the NRL models. Relative to the CDR V2, the CDR V3 incorporates many advances and new capabilities such as: the absolute irradiance scale of the full spectrum TSIS-1 Hybrid Solar Reference Spectrum (HSRS), a broader spectral range from the extreme ultraviolet through the far-infared (~0 to 200,000 nm) to support both the space weather and climate modeling communities, a separate higher spectral resolution SSI product to support the study of atmospheric chemistry and dynamics processes, and an irradiance prediction product forecasts TSI and SSI in several bands through 2100.

We will focus our discussions on the CDR V3 formulation and compare irradiance variability results on rotational and solar cycle time scale to irradiance observations and other models.

Solicited or Contributed

Contributed

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