The new climate data record of total and spectral solar irradiance: Current progress and future steps

Odele Coddington (1), Judith Lean (2), Gary Rottman (1), Peter Pilewskie (1,3), Martin Snow (1), and Doug Lindholm (1)

(1) Laboratory for Atmospheric and Space Physics, University of Colorado Boulder, Boulder, United States (odele.coddington@lasp.colorado.edu), (2) U. S. Naval Research Laboratory, Washington, DC, USA , (3) Department of Atmospheric and Oceanic Science, University of Colorado Boulder, Boulder, United States

We present a climate data record of Total Solar Irradiance (TSI) and Solar Spectral Irradiance (SSI), with associated time and wavelength dependent uncertainties, from 1610 to the present. The data record was developed jointly by the Laboratory for Atmospheric and Space Physics (LASP) at the University of Colorado Boulder and the Naval Research Laboratory (NRL) as part of the National Oceanographic and Atmospheric Administration's (NOAA) National Centers for Environmental Information (NCEI) Climate Data Record (CDR) Program, where the data record, source code, and supporting documentation are archived. TSI and SSI are constructed from models that determine the changes from quiet Sun conditions arising from bright faculae and dark sunspots on the solar disk using linear regression of proxies of solar magnetic activity with observations from the SOlar Radiation and Climate Experiment (SORCE) Total Irradiance Monitor (TIM), Spectral Irradiance Monitor (SIM), and SOlar Stellar Irradiance Comparison Experiment (SOLSTICE). We show that TSI can be separately modeled to within TIM's measurement accuracy from solar rotational to solar cycle time scales and we assume that SSI measurements are reliable on solar rotational time scales. We discuss the model formulation, uncertainty estimates, and operational implementation and present comparisons of the modeled TSI and SSI with the measurement record and with other solar irradiance models. We also discuss ongoing work to assess the sensitivity of the modeled irradiances to model assumptions, namely, the scaling of solar variability from rotational-to-cycle time scales and the representation of the sunspot darkening index.