Short-term Solar Irradiance Variability as Observed by TSIS SIM

Odele Coddington *[odele.coddington@lasp.colorado.edu], Erik Richard, and Peter Pilewskie; LASP / University of Colorado – Boulder, CO, USA*

The combination of the emergence and evolution of solar active regions with the 27-day solar rotation period axis alters the population of faculae and sunspots projected toward Earth and produces irradiance modulations. The irradiance modulations are wavelength-dependent because the relative influences of sunspots and faculae on solar irradiance change as a function of wavelength. For example, irradiance enhancements due to facular brightening dominate at wavelengths shorter than approximately 285 nm while variability at longer wavelengths has contributions from sunspots and faculae.

Since early 2018, the Total and Spectral Solar Irradiance Sensor (TSIS-1) mission has been making daily observations of solar spectral irradiance (SSI) from 200 nm to 2400 nm with the Spectral Irradiance Monitor (SIM). Technological advances of TSIS SIM, based on lessons learned from the heritage SIM instrument on the SOlar Radiation and Climate Experiment (SORCE) mission, provide a SSI dataset of higher precision, accuracy, and stability than previously attained.

In this work, we present the spectrum of the magnitude of short-term irradiance change observed by TSIS SIM as active regions rotated across the Sun's disk in April and May 2019. We compare the case study results to independent observations and to the Naval Research Laboratory solar spectral irradiance model, NRLSSI2. We discuss prospects for future model improvements and validation based on the TSIS SIM observations, particularly as solar activity begins to rise with the next cycle.