Progress toward a New, High-Resolution, High-Accuracy Solar Reference Spectrum based on TSIS-1 SIM

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A new, state-of-the-art, daily record of solar spectral irradiance (SSI) commenced in 2018 with the Spectral Irradiance Monitor (SIM) on the Total and Spectral Solar Irradiance Sensor (TSIS-1) mission. Technological advances of TSIS SIM, based on lessons learned from the heritage SIM on the SOlar Radiation and Climate Experiment (SORCE) mission, provide a SSI dataset of higher precision, accuracy, and stability than previously attained. The TSIS SIM absolute scale has been validated to much better than 0.5% accuracy over the majority of the spectrum during robust and extensive pre-launch characterization and calibration efforts.

In this presentation, we focus on incorporating our new understanding of the absolute scale of the solar spectrum into a new reference spectrum for atmospheric radiative transfer and remote sensing applications. Motivation for this development is demonstrated by results showing irradiance differences between TSIS SIM SSI and other, commonly used, reference spectra that reach 8%, particularly in the near-infrared portion of the spectrum. However, some remote sensing applications, such as trace gas retrievals, also require much higher spectral resolution than obtained by TSIS SIM alone. This necessitates renormalizing a high-resolution spectrum, measured at lower radiometric accuracy, to the absolute irradiance scale of TSIS SIM. We apply established techniques to perform this normalization and show initial results of our analysis for the Kitt Peak Solar Flux Atlas and the Solar Pseudo-Transmittance Spectrum.