Solar Spectral Irradiance Variability in the Near-Infrared and Correlations to the Variability of Total Solar Irradiance during the Declining Phase of Solar Cycle 23

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The Spectral Irradiance Monitor (SIM) as part of the NASA EOS SORCE mission continuously monitors the solar spectral irradiance (SSI) across the wavelength region spanning the ultraviolet, visible and near infrared (a region encompassing >97 of the TSI measured by the SORCE Total Irradiance Monitor, TIM). These are the first daily measurements from space with the required precision to detect real changes in SSI. The record of TSI measured from space tracks changes in solar total energy output and establishes the baseline for energy input for the Earth. Where this radiative energy is deposited into the Earth system, how the climate responds to solar variability, and the mechanisms of climate response, are determined by how the incident solar radiation is distributed with wavelength, the SSI. For the near IR region in particular, spectral decomposition of the TSI variability provides TOA constraints on the direct input for atmospheric heating simulations. We present here the first long-term, continuous measurements of the near infrared variability of solar spectral irradiance and establish quantitative correlations of near infrared variability across the spectral region of the solar H-minus opacity minimum with TSI variability. The unprecedented precision of the SIM near-infrared measurements provide a direct determination of the wavelength dependence of the facular and sunspot contrasts and serve to refine solar atmospheric models of the solar magnetic features that produce irradiance variability in emission from the deepest photospheric layers.