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Solar spectral irradiance model validation using Solar Spectral Irradiance and Solar Radius measurements

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The importance of the reliable solar spectral irradiance (SSI) data for solar and climate physics is now well acknowledged. In particular, the irradiance time series are necessary for most of the current studies concerning climate evolution. However, space instruments are vulnerable to the degradation due to the environment while ground based measurements are limited in wavelength range and need atmospheric effects corrections.
This is why SSI modeling is necessary to understand the mechanism of the solar irradiance variability and to provide long and uninterrupted irradiance records to climate and Earth atmosphere scientists. Here we present COSI (COde for Solar Irradiance) model of the SSI variability. The COSI model is based on the Non local thermodynamic Equilibrium Spectral SYnthesis Code (NESSY). We validate NESSY by two independent datasets:
- The SSI at solar minimum occurring in 2008,
- The radius variation with wavelength and absolute values determined from PREMOS and BOS instruments onboard the PICARD spacecraft.
Comparisons between modeling and measured SSI will be shown. However, since SSI measurements have an accuracy estimated between 2 to 3%, the comparison with the solar radius data provides a very important additional constrains on model. For that, 17 partial solar occultations by the Moon are used providing solar radii clearly showing the dependence of the solar radius with wavelength. These results are compared with the NESSY predictions. The agreement between NESSY and observations is within the model and measurements accuracy.