Developing a Proxy Model for Solar EUV Irradiance using SORCE and GOES

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Several instruments are able to measure the full EUV spectrum at sufficient wavelength resolution for those interested in upper-atmosphere modeling, the effects of space weather, and modeling satellite drag. No missions are planned at present to succeed TIMED and SDO, which currently provide this data source. In order to develop a suitable replacement for these measurements, we use the magnesium core-to-wing ratio from SORCE SOLSTICE as well as broad-band EUV measurements made by the NOAA GOES satellite to model the EUV spectrum from 0.1-105 nm at 5 nm resolution. Using a Levenberg-Marquardt least squares fitting algorithm, we determined a matrix of coefficients that could be multiplied by our input data time series to produce our output data time series. As inputs, we used the SORCE Mg II index, the GOES EUVS-B, EUVS-E, XRS-A, and XRS-B channels as well as 40-day backwards smoothed versions of these time series to provide operationally useful data with the Carrington rotation dependence removed. We fit to the observed spectrum from TIMED SEE and SDO EVE for the full 2012 year. Applying this model to 2011 and the first six months of 2013, we found that the correlation between the model predictions and the observed spectrum was above 90% for the 0.1-50 nm range, and between 60% and 90% for the 50-105 nm range. These results provide a very promising potential source for an empirical EUV spectral model after direct measurements are no longer available.