PHOTOELECTRONS AS A TOOL TO EVALUATE SPECTRAL VARIATIONS IN SOLAR EUV IRRADIANCE OVER SOLAR CYCLE TIME SCALES

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There is limited quantitative information about the relative magnitude of the spectral variations in the ionizing component of solar irradiance on solar cycle time scales. We found that the TIMED/SEE Version 9 Level 3 irradiance values predict relatively more ionospheric heating at solar minimum than those from Version 8. These changes have direct impacts on solar cycle timescale variations in ionospheric and thermospheric energy inputs derived from these irradiance values.

Photoelectron observations from the FAST satellite obtained from 2002 to 2008 are used along with solar irradiance data, ionospheric models, and models of solar irradiance to examine the solar cycle variations of irradiance in the 4-27 nm range derived from the XPS sensor in the TIMED/SEE instrument suite. Good agreement is found between daily photoelectron observations and model predictions. The largest differences between observed and modeled fluxes are in the 4-10 nm range, where the data show that the SEE Version 9 Level 3 irradiances are systematically low.

Our analysis suggests that variation on solar cycle time scales in the TIMED/SEE Version 9 Level 3 and FISM irradiance derived from them are systematically low in the 18-27 nm region. Because of uncertainties in the absolute value of the observed photoelectron fluxes and solar irradiances, the differences between observed and modeled photoelectron fluxes presented here are not sufficient to determine more exactly the magnitude of variation on solar cycle time scales of solar irradiance in the 4-27 nm region. These suggestions can be confirmed by observations that will be made on the Solar Dynamics Observatory (SDO) mission.

Solar irradiance, variability of solar irradiance, thermospheric energy deposition

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