Variations of the Solar flux in the 1 to 50 nm range over a solar rotation inferred from observations of photoelectrons with energies from 0.01 to 1 keV from the FAST satellite

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We have analyzed one minute average photoelectron energy spectra from 10 eV to 1 keV observed at ˜ 3,000 km, equatorward of the auroral oval for the July-August, 2002 Solar rotation. Variations in these photoelectron spectra arise primarily from variations in the Solar flux in the 1 to 50 nm range and to a lesser extent changes in the composition of the top-side ionosphere where the photoelectrons are produced. We find modest correlations ($0.5 < R < 0.7$) of the variations of photoelectron flux at specific energies with broad-band observations of the solar flux in this energy range from GOES, TIMED, and SOHO. We also find modest correlations with higher resolution estimates of the solar irradiance derived from the Flare Irradiance Spectral Model (FISM).

Examination of the correlations between variations of the photoelectron fluxes at different energies revealed significantly different correlation characteristics in 43 distinct energy bands. Above ˜200 eV (corresponding to solar radiation below ˜6 nm) correlations in the range between 0.6 and 0.8 are found between intensities in other energy bands above 200 eV, correlations of ˜0.5 are found with energy bands between 30 and 50 eV. In the range 50 to 200 eV (corresponding to solar radiation between ˜20 and 6 nm) correlations above 0.8 are found for a band of energies close to these energies. Below 50 eV correlations between photoelectron fluxes at different energies become more complex.

We will discuss these data and their implications to the assumptions commonly made in estimating the narrow band solar irradiances required for aeronomic calculations.