M08a XUV Spectra of Active Solar-like Stars: Extension of Solar Empirical Laws

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The X-ray and EUV (XUV) emissions from cool dwarf stars are essential for understanding the stellar coronal heating and their impact on (exo)planetary atmospheres. However, characterization of a full stellar XUV spectrum is a difficult task, especially in the EUV band. Previous studies characterized the empirical relationship between XUV radiation flux and surface magnetic field fluxes (e.g., Toriumi & Airapetian 2022), but the later study was limited to the selected wavebands or spectral lines of interest. Here, we present the response of the full solar XUV spectrum (from X-ray to FUV) to the solar total unsigned magnetic flux with the use of long-term dataset obtained by SDO/HMI&EVE, SOHO/MDI, SORCE/XPS&SOLSTICE, and TIMED/SEE. We derived power-law relations for each wavelength with a spectral resolution of 1-10 Å. We applied the scaling relations to nearby active solar-like stars including EK Dra (G1.5V), π1 Uma (G1.5V), and κ1 Ceti (G5V). These stars represent the limited number of targets for which total unsigned magnetic fluxes and XUV spectra (except for most of the EUV range) are currently available. We found that the XUV spectra of these stars estimated from the derived empirical relation are roughly consistent with the observed spectra for a large range of wavebands and emission lines, within errors of one order of magnitude. This result suggests that the solar power-law relations may be helpful in estimating a full set of XUV fluxes for other solar-like (G and K) stars from the measured surface magnetic fluxes.