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Modelling solar irradiances with proxies of activity along a cycle

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There is a pressing need to model XUV solar irradiances, given the scarcity of current measurements. One of the measurable effects of a solar cycle is the significant (more than one order of magnitude) variation in XUV irradiance. XUV radiation drives the ionosphere and the thermosphere. As a first step in the modelling, we present EUV irradiances in a sample of strong spectral lines formed in different layers and regions of the solar atmosphere, obtained from the Solar Dynamics Observatory Extreme Ultraviolet Variability Experiment (SDO EVE) during 2010-2024 and the Solar and Heliospheric Observatory Coronal Diagnostic Spectrometer (SOHO CDS) covering the earlier maxima (1998-2014). We used the recently released version 8 EVE data. We present correlations with several proxies of solar activity, such as the Mg II index, sunspot numbers, and cm radio fluxes. Among these, the sunspot number proves to be the poorest proxy, whereas the Mg II index is a very good proxy for coronal lines (hotter temperature lines). We find a relatively strong linear relationship, which enables us to build a model essential for various applications. We find relatively good agreement between the SOHO CDS and SDO EVE irradiances for most of the stronger lines.

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