Project Details

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Project Title:
The Development of a New Model of Solar EUV Irradiance Variability

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Summary:
The Sun's extreme ultraviolet radiation (EUV, 50-1200 A) exerts a powerful influence on the Earth's upper atmosphere. Variations in solar EUV radiation drive significant changes in the density and ionization of the Earth's thermosphere and ionosphere. These changes affect the performance of ground and space based communication systems and spacecraft in low Earth orbit.
Because of the limitations of existing irradiance data and the empirical models derived from them, we have recently developed a new model of solar EUV irradiance variability that is independent of irradiance observations. Our model is based on intensities calculated from emission measure distributions, a simple model of limb-brightening, and analysis of full-disk solar images.
The initial comparisons between calculations from our model and existing irradiance data have been very encouraging. For example, our model predicts irradiances for many chromospheric, transition region, and coronal emission lines that are generally consistent with a recent, well-calibrated EUV irradiance observation. Our model can also reproduce much of the rotational modulation evident in the Atmospheric Explorer E (AE-E) irradiance observations near solar maximum.
The AE-E irradiance data, however, generally show significantly more solar-cycle variability than is evident in our modeled irradiances. Our model also predicts irradiances for some optically thick emission that are inconsistent with other irradiance observations. Finally, at wavelengths shorter than 170 A our model predicts irradiances that are much smaller than those that have been observed.
We propose to resolve these fundamental issues by incorporating observations from the CDS and SUMER spectrometers on SoHO, SXT on Yohkoh, and the Big Bear Solar Observatory into our model. Our primary objective is to use spatially resolved spectra to construct new emission measure distributions and to establish relationships between these emission measure distributions and the intensities observed in the full-disk images. This will allow us to make much more accurate calculations of the solar EUV irradiance at all temporal scales.

Publication References:

no references