A Method of Identifying Solar Features in EUV Images using Intensity Thresholds

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ABSTRACT

I present a method of determining the fractional areas on the sun's surface covered by different features using images taken with the Extreme-Ultraviolet Imaging Telescope (EIT) onboard the SOHO satellite. Scientists at the Laboratory of Atmospheric and Space Physics (LASP) developed a spectral solar irradiance model called the Solar Radiation Physical Model (SRPM) which will be used to model the solar spectrum at all stages of the solar cycle. This model calculates the spectrum for six distinct solar features in the corona: coronal holes, quiet sun, quiet network, active network, hot loops, and super-hot features. In order to predict the spectral irradiance of the sun, SRPM requires the input of the solar area covered by each of these six features in each of the EIT image wavelengths (171 Å, 195 Å, 284 Å, and 304 Å). To determine the thresholds, I created intensity histograms of the EIT images that show distinct variations corresponding to the different features visible on the solar surface. Using these histograms, I created a system of intensity thresholds with which to identify each solar feature. The background pixels were then removed from the SOHO images and the thresholds were applied to calculate the area covered by each coronal phenomenon. This method was applied to images from July 2002 through November 2006 in order to observe variations throughout the solar cycle. The resulting thresholds for the 171 Å, 195 Å and 304 Å images turned out to be practically time-independent and thus valid throughout the entire solar cycle. However, the 284 Å images show a distinctly different behavior, i.e. the thresholds for each feature are a function of solar activity. This result poses a challenge for irradiance reconstructions since the time-independent synthetic spectra require thresholds that are not a function of solar activity.