Pictures Speak 1000 Words: Seeing the Sun Through the Soft X-Ray

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Solar Radiation can effect our communication and navigation systems here on Earth. In particular, solar X-ray (SXR) and extreme ultraviolet (EUV) radiation is responsible for ionizing (charging) earth's upper atmosphere, and sudden changes in the ionosphere can disrupt high frequency communication systems (e.g. airplane-to-ground) and degrade the location accuracy for GPS navigation. New soft X-ray flare data are needed to study the sources for the SXR radiation and variability of the solar flares and thus help to answer questions if all flares follow the same trend or have different plasma characteristics? In December 2015, the Miniature X-Ray Solar Spectrometer (MinXSS) launched from Cape Canaveral Florida to answer those questions. The MinXSS CubeSat is a miniature satellite that was designed to measure the soft X-ray spectra and study flares in the 1-15 Å wavelength range. So far, the CubeSat has observed more than ten flares. The MinXSS flare data are plotted in energy vs irradiance to display the soft X-ray spectra, and these spectra are compared with different types of CHIANTI models of the soft X-ray radiation. One comparison is for non-flaring spectra using AIA EUV images to identify solar features called active regions, coronal holes, and quiet sun, and then using the fractional area of each feature to calculate a CHIANTI-based spectrum. This comparison reveals how important the active region radiation is for the SXR spectra. A second comparison is for flare spectra to several isothermal models that were created using CHIANTI. The isothermal model comparisons were done with both the raw count spectra from MinXSS and the derived irradiance spectra. This dual comparison helps to validate the irradiance conversion algorithm for MinXSS. Comparisons of the MinXSS data to the models show that flares tend to follow a temperature pattern. Analysis of the MinXSS data can help us understand our sun better, could lead to better forecasts of solar flares, and thus help to protect our space weather sensitive technology.