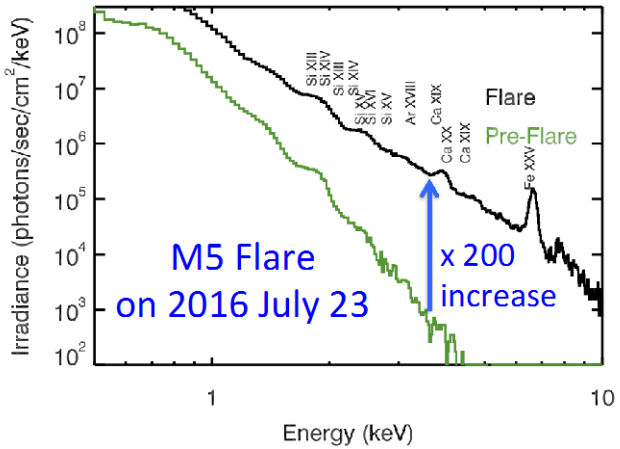
Heliophysics MinXSS CubeSat Fills Critical Gap in Solar Spectral Irradiance Data

MinXSS CubeSat data fill an important spectral gap in solar irradiance measurements, collecting soft X-ray (SXR) data at spectral resolutions we haven't obtained before. The SXR region has mostly been measured by broadband photometers in 3-7 nanometer wide bands on missions like GOES, SDO, SNOE, SORCE and TIMED. MinXSS will not only provide up to 100 times more spectral information than the data we have from other missions, but will also calibrate the broadband photometer measurements spanning decades from those missions.

Studying SXR data from the sun can tell us important things about its corona or atmosphere; such as its temperature, density and chemical composition. Many scientists are interested in research and data that will help connect coronal events, like solar flares, to processes that will help us better understand one of the biggest mysteries we have about the sun and its processes, called the coronal heating problem. The sun's corona is very hot compared to its surface and we don't fully know why. Analyzing MinXSS data will help scientists search for answers to this mystery.

Administrator Bolden visited the MinXSS students in 2014, providing insight and advice in developing the mission. Over 45 students have worked on MinXSS.



This is a MinXSS measurement of the M5.0 flare taken on July 23, 2016 and indicates a factor of 200 increase in the brightness of soft X-ray (SXR) emissions. The pre-flare spectrum is the green line, and the flare spectrum is the black line. Some of the brighter coronal emissions lines are also labeled.

MinXSS, the first CubeSat ever launched for the Science Mission Directorate, has been collecting data since its deployment from the International Space Station on May 16th of this year. MinXSS collects data on the energetics of solar flare emissions and how this energy impacts our atmosphere and ionosphere. By July, it had already met its minimum mission science criteria for science data and observations, seeing over 7 M-class solar flares and over 40 C-class flares. The minimum mission science criteria for MinXSS is to collect measurements of solar full-disk irradiance in SXR with a spectral resolution better than 1 nanometer, to sustain 30% accuracy for a minimum of one month, and to observe at least 6 medium-sized flares. MinXSS also won the 2016 AIAA Small Satellite Mission of the Year Award in August.

MinXSS itself is not much larger than a loaf of bread yet can take narrowly-targeted scientific observations, that fill a critical gap in existing solar irradiance measurements. This new and important MinXSS data is publically available and easily accessible online. A paper on what scientists are beginning to learn from MinXSS is in draft. The authors hope to see it published within the next few months.

MinXSS is a 3-Unit (3U) CubeSat built and operated by University of Colorado Boulder students and faculty at the Laboratory for Atmospheric and Space Physics (LASP) and the Aerospace Engineering Sciences Department (AES); the MinXSS team also includes scientists from NASA GSFC, SwRI, and NCAR. The NASA HQ Heliophysics Division manages CubeSat activities for the Science Mission Directorate.