Title:
A DEFT New Way to Forecast Flares

Student: Matthew Chih - Marietta College
Mentor: Larisza Krista - University of Colorado/CIRES, NOAA/NCEI

Abstract:

Solar flares have the capacity to cause significant technological disturbances on Earth. For instance, they may lead to interference with satellite operations, telecommunications, aviation, and navigation. The effects of flares may impact Earth just minutes after a flare eruption, therefore early detection is essential to space weather forecasting. The current flare detection method used by the NOAA Space Weather Prediction Center (SWPC) requires a continuously increasing X-ray flux for four consecutive minutes and surpassing an alert threshold. After these criteria have been met, SWPC is able to send out a warning to help mitigate hazardous effects. We have developed an innovative and novel method to improve the existing forecasting efforts. The GOES Solar UltraViolet Imager (SUVI) produces full-disk solar images in six wavelengths from which we can create intensity histograms. Compared to the current forecasting methods our approach has the advantage of spatial resolution, thus we are able to distinguish the locations of concurrent EUV signatures. As well as identifying the early signs of flares, we can also identify their specific heliographic locations. During our initial investigation, we discovered two types of flare signatures. In addition to detecting the main stage flare up to seven minutes early, we are also able to identify a much earlier precursor signature up to an hour in advance. We found the 304 Å wavelength to be the most successful in detecting the earliest flare indicators, identifying them in 74% of the cases studied.