Title: Deriving Plasma Temperatures for Solar Features

Student: Amanda Shackelford (University of California Irvine)

Mentors: Jon Darnel (CU Boulder/NOAA) and Dan Seaton (CU Boulder/NOAA)

Abstract:

A method for performing differential emission measure (DEM) inversions in python has been developed. The method provides positive definite DEM solutions by a linear program solver. DEM analysis was performed on EUV images from the new Solar Ultraviolet Imager (SUVI) aboard NOAA's GOES-16 satellite. The SUVI instrument collects full-disc images of the sun in six wavelengths centered on known EUV emission lines. Embedded in the SUVI dataset is the signature of physical processes that drive the formation of classified solar features such as coronal holes, flares, mass ejections, bright regions, quiet corona, and filaments. The impacts due to space weather caused by solar eruptions can be costly and potentially dangerous. Large events can lead to the destruction of power grids and damage to satellites. Providing space weather forecasters with the tools and information to better predict events and suggest safe operational procedures would allow the risks to be mitigated. An accurate automated method to interpret these images would potentially lead to a better classification system and greater ability to predict future solar events. DEM analysis provides temperature maps which can be used as another check for the physical interpretation of solar features. As methods are being developed for automated characterization of solar images, the incorporation of a temperature map could allow for the differentiation between solar features which otherwise look very similar based solely on pixel intensity. However, there are many challenges this project faces such as optimization of python solvers and consistent results when compared to models.