For many years, thermosphere and ionosphere modellers, including those supporting NOAA and the Department of Defense (DOD), have been requesting solar extreme ultraviolet (EUV) irradiance data for ionospheric and thermospheric modeling because it is a key variable to these systems. Variations in EUV irradiance produce large variations in neutral and electron densities on timescales ranging from minutes to years. Currently models have been using F10.7 radio flux data, which is a proxy for EUV and is only available at a daily cadence. In response to these requests, the Geostationary Operational Environment Satellites (GOES) 13, 14, and 15 suites of space weather sensors included the capability to measure EUV irradiance with an instrument called the EUV Sensor (EUVS). The EUVS measures irradiance in five separate broadband channels at a cadence of 10 seconds. However, until now the data has remained unused because it had not been analyzed and made ready for public access. The focus of this project has been to create a continuous record of EUV irradiance in the A, B, and E broadband channels at a cadence of one minute dating back to July 2009 using the EUVS data from GOES 13, 14, and 15. In order to do this, we compared the data between the three different satellites during their operational time periods, specifically when those periods overlapped. We then scaled the data to one another to create a smooth, continuous record that could actually be used rather than the disjointed one that existed prior to the adjustments.

**Who Cares About Solar EUV Irradiance?**
- The Solar Spectrum is Highly Variable in the Extreme Ultraviolet (EUV)
- EUV Radiation Heats the Upper Atmosphere
- Changes in the Solar EUV Flux Cause Very Large Changes in the Upper Atmosphere

The intensity of the solar EUV emissions change by a factor of 4 from solar minimum to solar maximum. This EUV radiation is one of the primary sources of heat for the upper atmosphere.

The EUV Sensor
- The F10.7 cm radio flux is most often used as a proxy for solar EUV flux but it often does not track the EUV well. Using F10.7 cm flux in atmospheric modeling produces each of the introduce errors that are typically 20% and can be as large as 40%.
- EUV-A is most often used in the A channel.
- EUV-B is most often used in the B channel.
- EUV-C is most often used in the C channel.
- EUV-D is most often used in the D channel.
- EUV-E is most often used in the E channel.

The plot to the left shows the instrumental drift between the raw data sets as you go further away from the data in which you focused on to calculate the scaling coefficients.

**The Record of Solar EUV Irradiance from GOES EUVS**
- The record dates back to July 2009 and consists of EUV irradiance data from EUVs on GOES 13, 14, and 15.
- The following graphs are the final product of our work in the A, B, and E channels. In all three graphs, the gray indicates one minute data, where the colored lines are 6 hour averages of the one minute data, which helped clean up some of the noise found in the data. The A channel shows a lot of noise, much of which is believed to be caused due to a heater on board the instrument. The weekly calibrations also cause a lot of noise within the data. Lastly, you might notice the difference in trends between the A & B channels versus the E channel. The A & B plots show the gradual increase in irradiance that is to be expected as we come out of solar minimum, whereas the E channel plot doesn’t show any concrete trend. We attributed this to degradation in the instrument, which we are unsure of the cause at this point.

**Initial Data Analysis**
- To begin scaling the data, we first had to find when the operational time periods for each satellite overlapped. Once the overlapping time periods were found, we then found fluxes within those periods to offer some variability for easier better scaling. Next, we plotted the raw data against each other and found a line of best fit to find a multiplicative and additive coefficient. We then applied those coefficients to the chosen data set to produce the scaled plot you see on the bottom.

**Summary**
- There is still much to be done with the EUV irradiance data from the GOES satellites. Further comparisons need to be made to SDO, EVE, & SOHO data sets. We also need to take a closer look at the instrument degradation, and other artifacts skewing the data; specifically the heater noise, weekly calibrations, and instrument degradation in the E channel. Once the data is cleaned up, absolute calibrations need to be made, as the adjustments we made were only rough, initial ones. Finally once that is complete, we would like to make the data available on a webpage in real time for the public and DOD to utilize for those models of the Ionosphere and Thermosphere. Eventually we hope that the GOES data will become the standard when it comes to investigating EUV irradiance.