



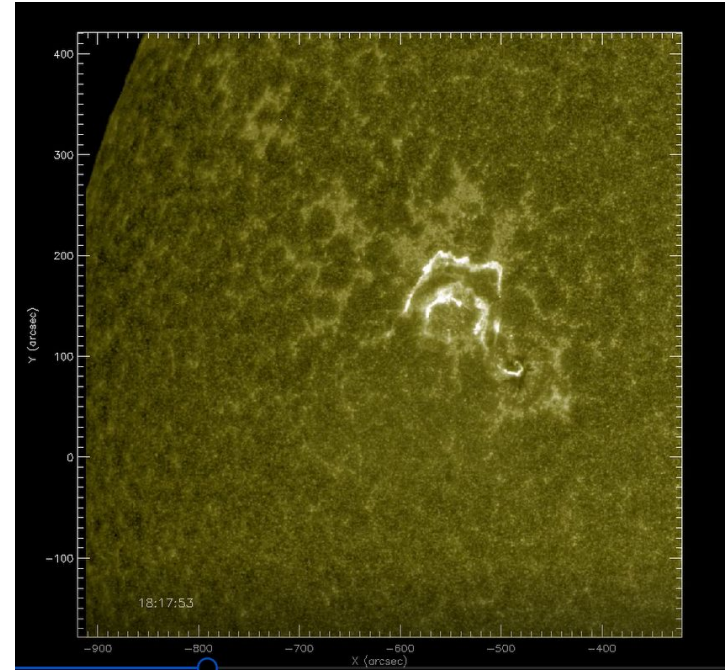
# Energy Partition of the Flare-CME Events

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## Background / Objective

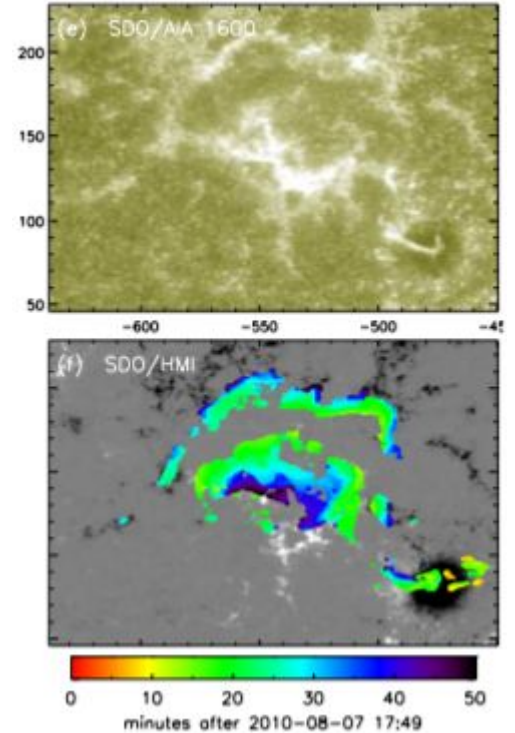
Goal: To find the energy partition of the CME and the flare

- How much energy goes to the flares?
- How much energy is released with the CMEs?



# Methods Overview

- Calculate energies separately, then compare
- CME
  - STEREO Images
    - Brightness corresponding to the mass concentration
  - Find the center of mass, track its motion over time
- Flare
  - SDO Images
  - EBTEL (enthalpy-based thermal evolution of loops)
  - Determining unknown scaling factors



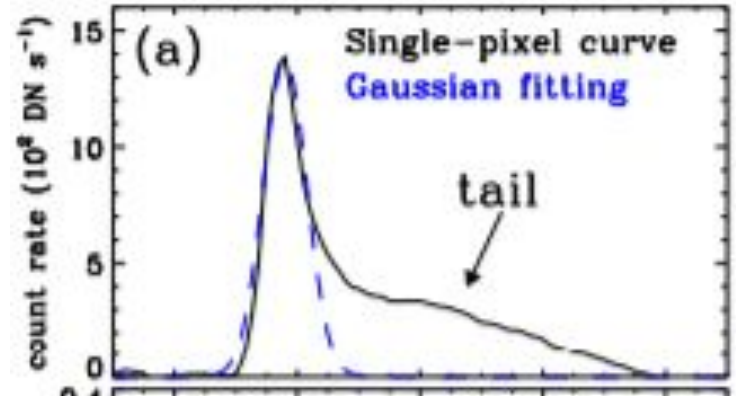
# Basic Steps for Calculating Flare Energies

Step 1: Finding flare ribbons

- Look for bright pixels in images from SDO

Step 2: Finding information needed for calculation

- Apply Gaussian fitting to the light curves
- Model magnetic field lines and determine their lengths





# Basic Steps for Calculating Flare Energies

Step 3: Calculating temperature and density

- Try different test values for unknown scaling factors

Step 4: Generating synthetic emission curves

Step 5: Compare synthetic emission curves with observed light curves

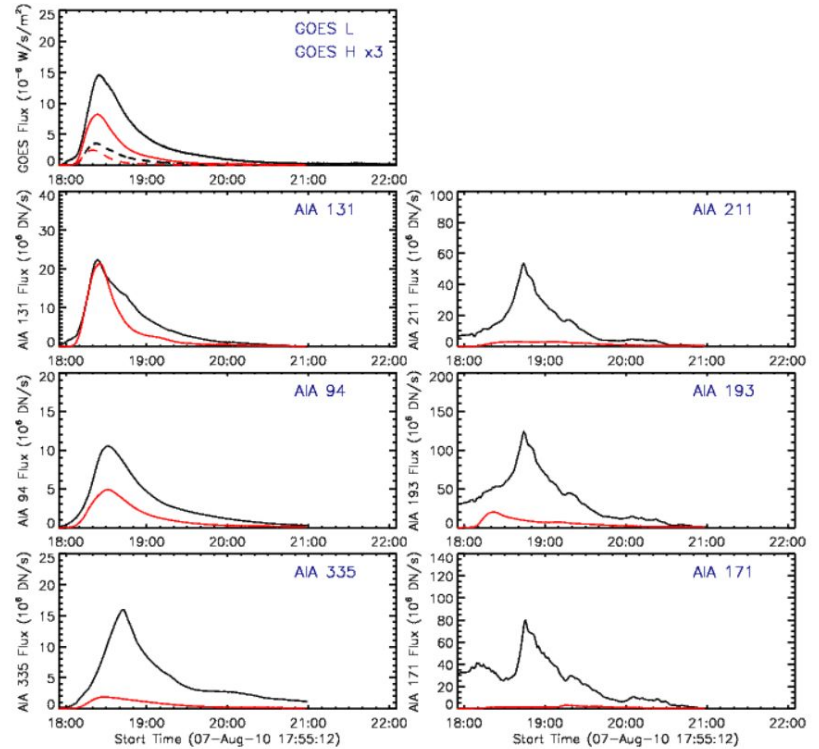
- Determine what combination of the test values give the best emission curves

Step 6: Energy Evolution

- Observe how the amount of heat put into the flares and radiation loss from the corona and the transition region changes over time

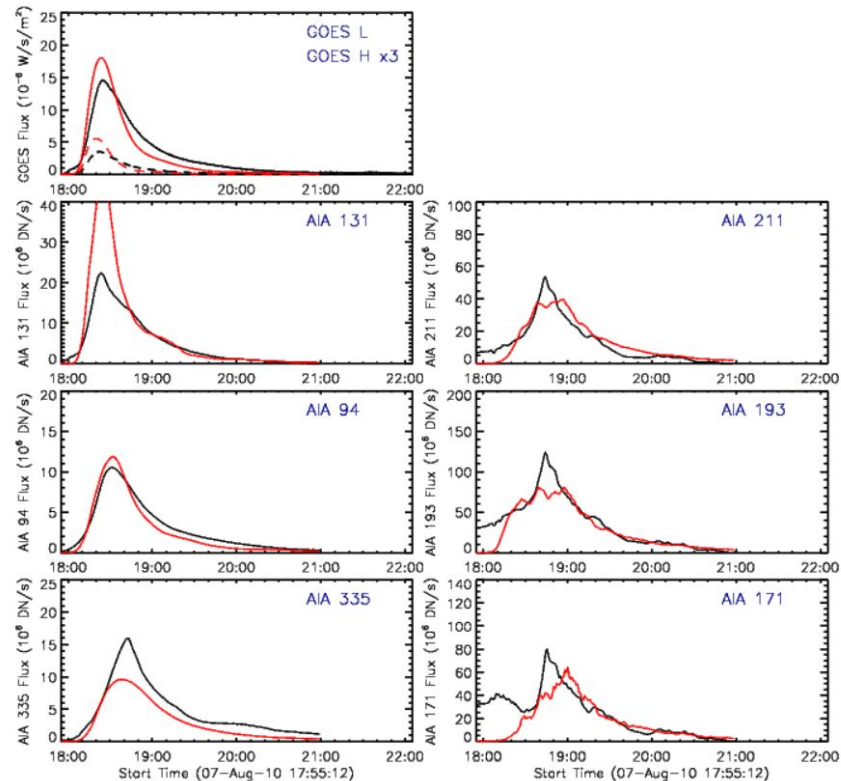


# Synthetic Emission v.s. Observed Lightcurves





# Synthetic Emission v.s. Observed Lightcurves





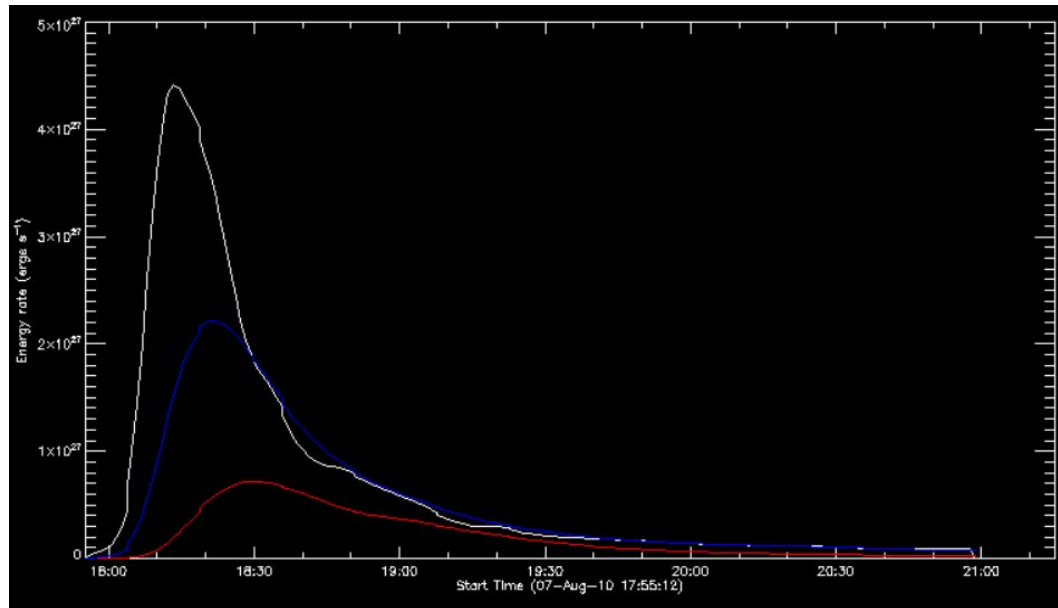
## Results so far

- Finding the best ways to compare synthetic emission to the original lightcurves
  - Area method
  - Correlation method
- Finding the best combination of values for the 3 parameters
  - 4/125 combinations making top 10 in both methods
- Generating energy evolution plot





## Example of an Energy Evolution Plot





## What's Next

- Make adjustments to the comparison methods if necessary
- Determining the best 3 values for the scaling factors in more precision
- Calculate CME energies
- Work on more flare events
- Compare energies to get the energy partition