

## Abstract

The AIA instrument on the *Solar Dynamics Observatory* obtains images of the sun in seven different extreme ultraviolet wavebands. Each filter produces images with distinctive appearance that is apparent to experienced observers. Subjective descriptions abound in the literature and in conference presentations, as do qualitative explanations of the physical reasons for these differences. We seek a quantitative description of the image properties, with the aim of understanding what the general image properties indicate about the temperature structure of the corona. Our preliminary results, obtained at multiple heliocentric angles above and below the limb, show that some channels consistently present a high or low intensity contrast which we attribute to the differing temperature, density and filling factor of the structures imaged. We also investigate the power spectra characteristic of each waveband.

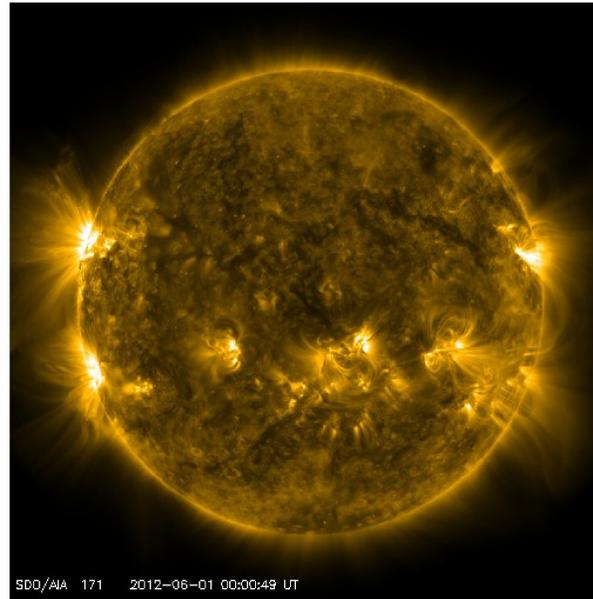
## Analysis

Our approach has been to extract a 16384-element array consisting of the interpolated intensities inside different heliocentric annular regions. We have been using a width of 5 pixels for the annular regions. In order to normalize these arrays we divide each one of them by their corresponding median value. To compare these normalized arrays we have been constructing histograms and power spectra. The histograms enable us to compare the intensity distribution of the corresponding waveband in each annular region in an efficient manner. The x axis of the power spectra is given in units of cycles per arcsecond. In order to be able to present as much detail as possible in the plots we have log scaled the axes. Some samples of these plots are presented in the plot box. We also calculate the 25th and 75th percentile of each array. The plots of the difference of these two values against the time period of each set of images corresponding to the arrays provide a great way to compare the contrast of the images in a quantitative way. To this point we have 6 sets of images, each one with a twelve day interval and cadence of one day. The corresponding plots can be seen in the plot box.

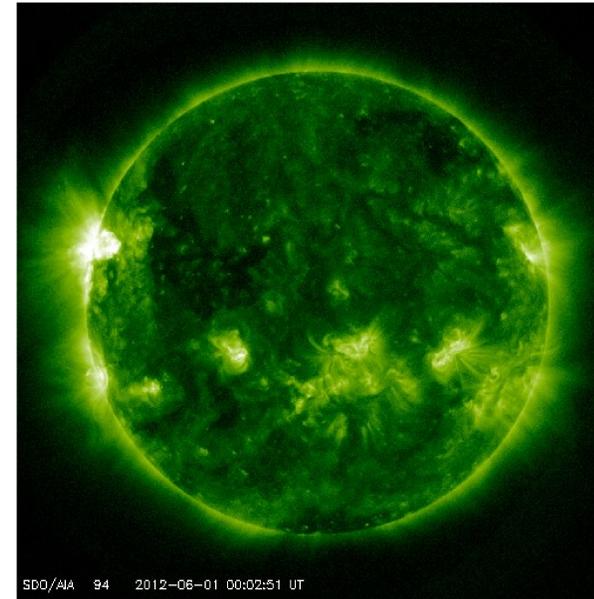
## Acknowledgements

- MSU Solar Physics REU / NSF Grant 4W3916

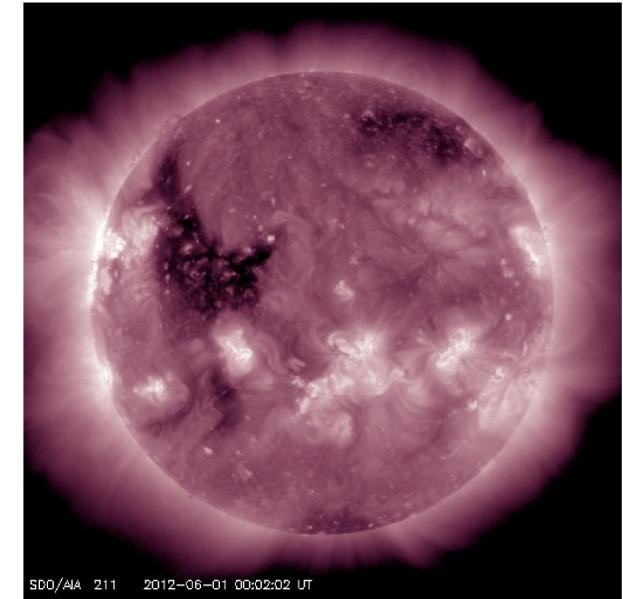
## Data *Solar Dynamics Observatory/AIA* 2012/06/01:2012/08/24



SDO/AIA 171 Å 2012-06-01.

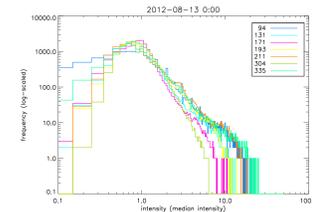


SDO/AIA 94 Å 2012-06-01.

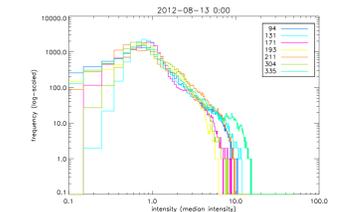
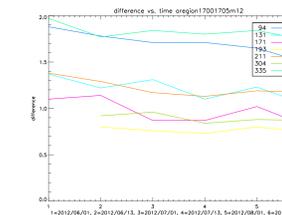
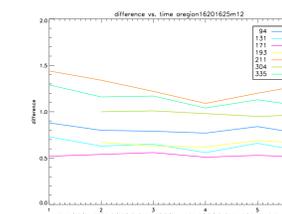
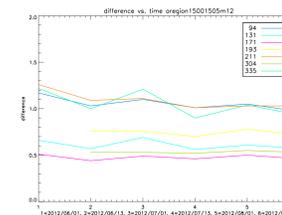
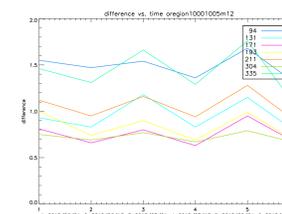
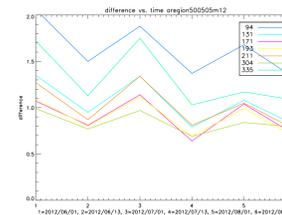
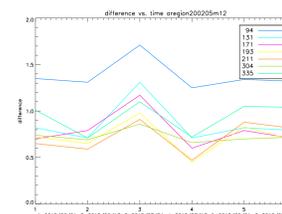
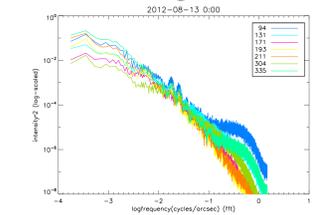


SDO/AIA 211 Å 2012-06-01.

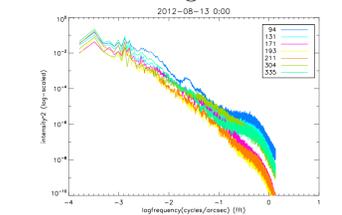
## Plots



Annular Region: 1500-1505



Annular Region: 1620-1625



## Conclusions

- Some wavebands consistently present a higher contrast than others.
- There seems to be a correlation between the heliocentric annular region selected and the intensity contrast of the wavebands.
- These results could possibly be attributed to the temperature and filling factor of the imaged plasma.
- The power spectra of the data look similar except for some bumps in the higher frequencies of the 94 Å, 204 Å and 131 Å passbands

## Next Steps

- Bump the number of images in each set to 28 with a cadence of 24 hours (Roughly a full Carrington rotation of the sun)
- Confirm the consistent intensity contrast behaviour of the different wavebands.
- Try to explain how the filling factor varies with height for plasma in a given temperature range.