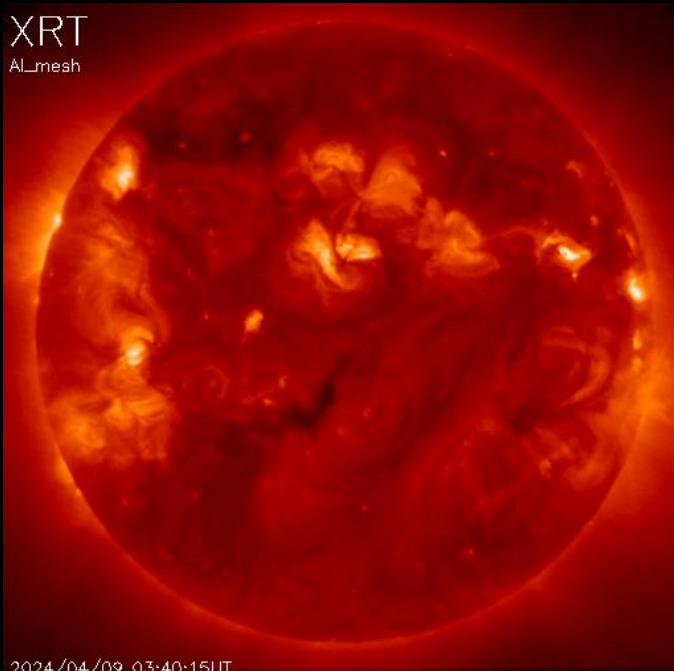


# Comparing the Soft X-ray Irradiance from the Corona and the Magnetic Flux on the Sun's Surface

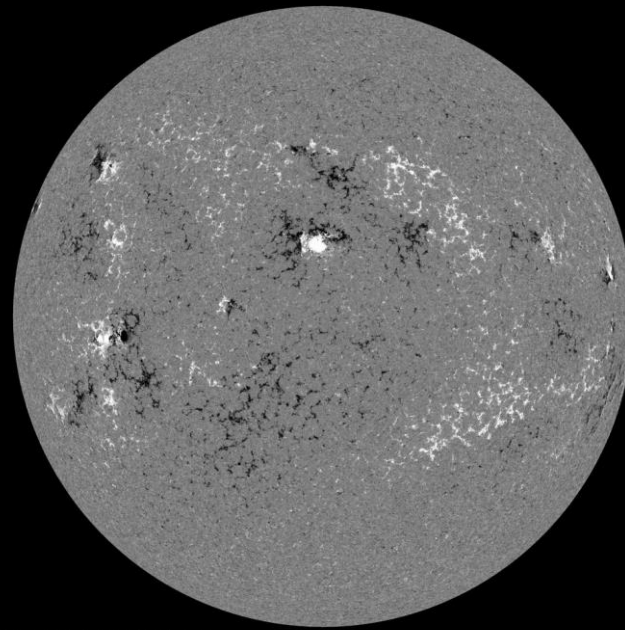
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Kelvin Scheurer

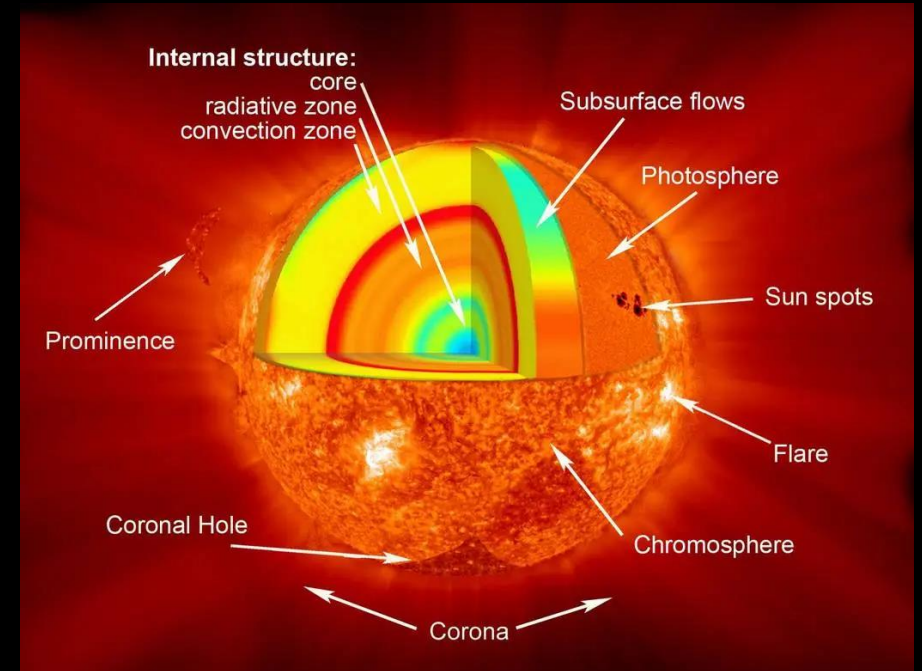
Mentor Dr. Keiji Yoshimura



Soft X-ray image  
Hinode/XRT



Magnetogram  
SDO/HMI



[Image from NASA article](#)

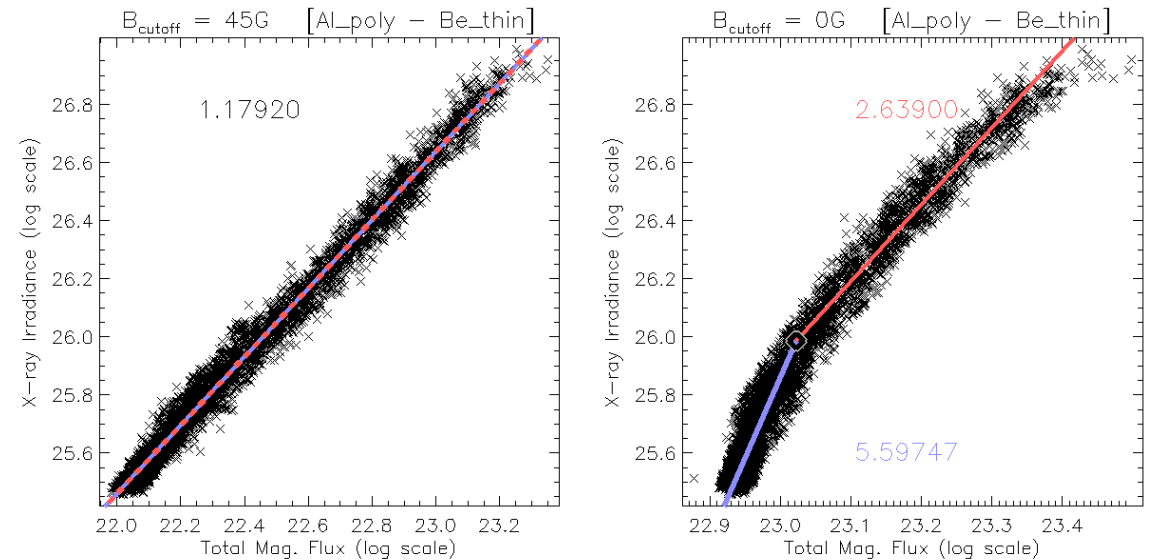
# Project Motivation

- Surface of Sun approximately (6,000K)
- Corona > 1,000,000K
- Find characteristics of unknown heating mechanisms
- Use XRT (X-ray telescope) aboard the HINODE space telescope to observe the corona
- Use HMI (Helioseismic and Magnetic Imager) aboard SDO (Solar Dynamics Observatory) to observe magnetic fields
- Pevtsov et al (2003) showed relationship between X-ray luminosity and magnetic flux, leads into previous work

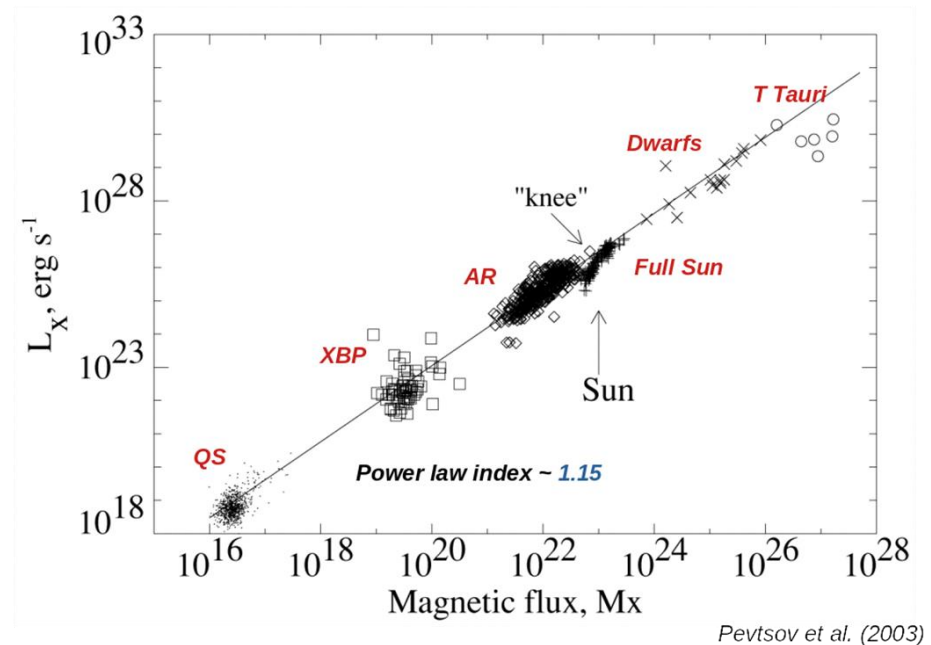
# Previous Work Yoshimura et al (2024)

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- Reproducing the knee structure
- Used Hinode/XRT and SDO/HMI data
- Results show reproduction of knee is dependent on parameters chosen



Relationship between X-ray luminosity and magnetic flux

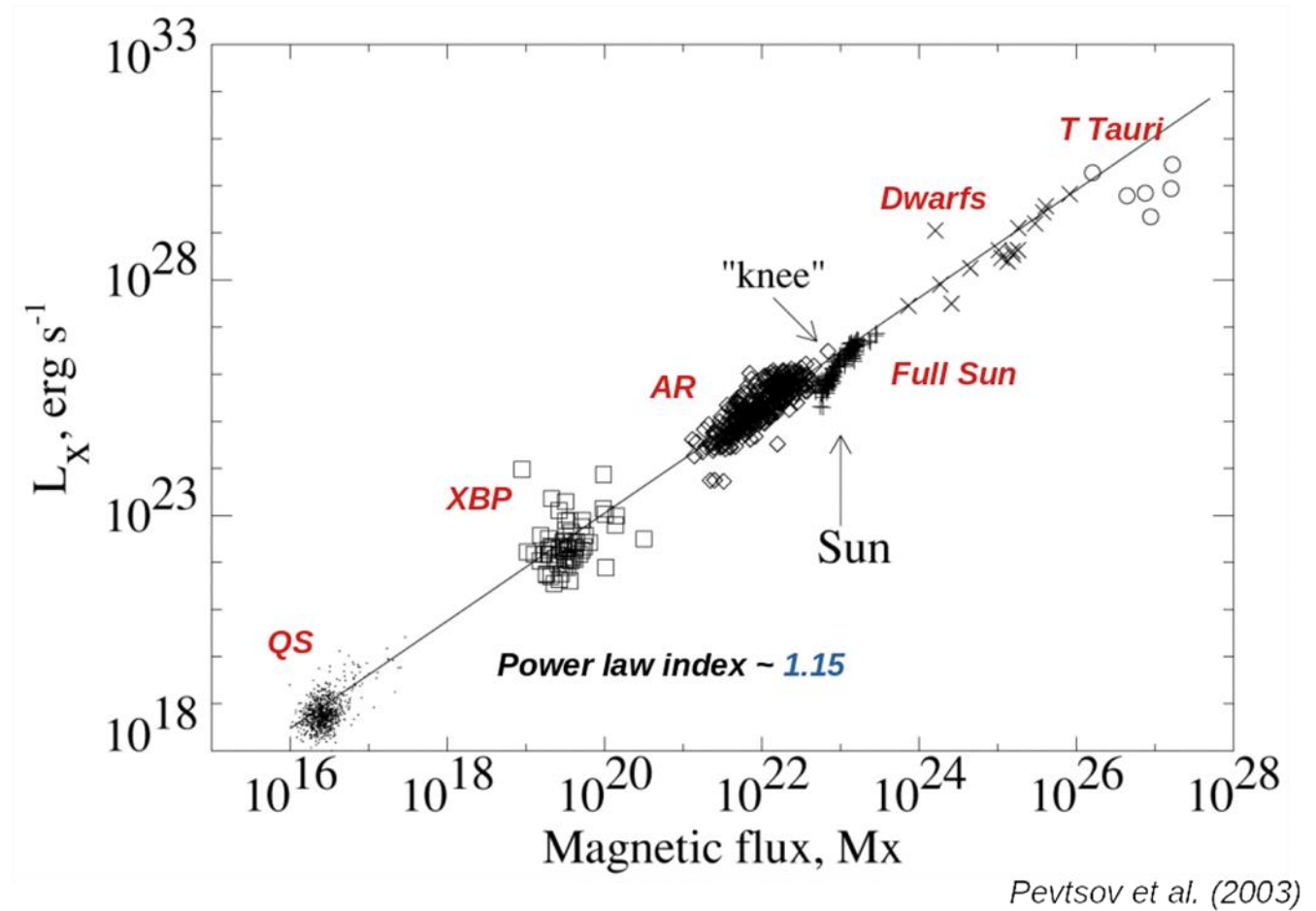


# Project Objective

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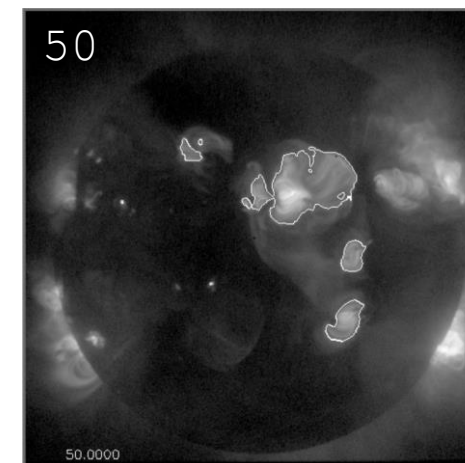
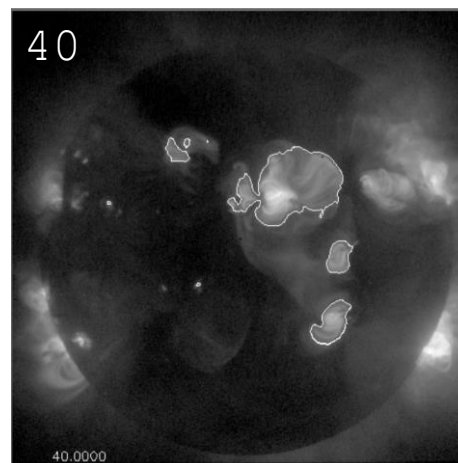
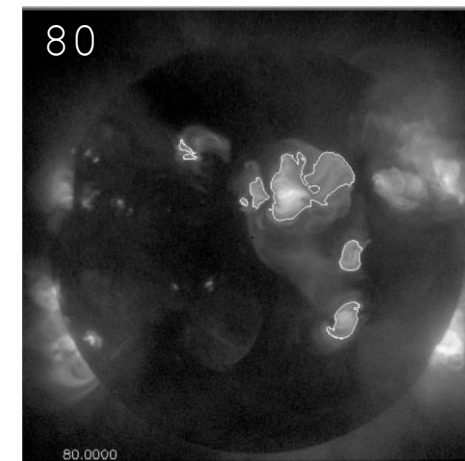
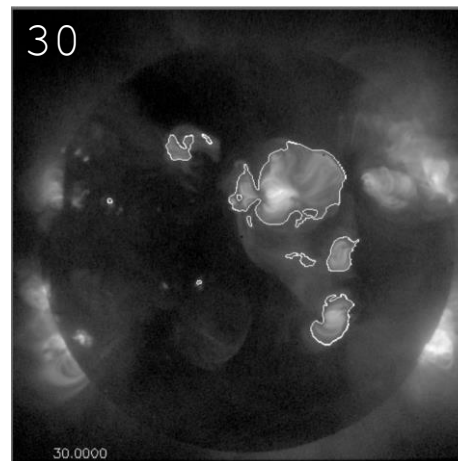
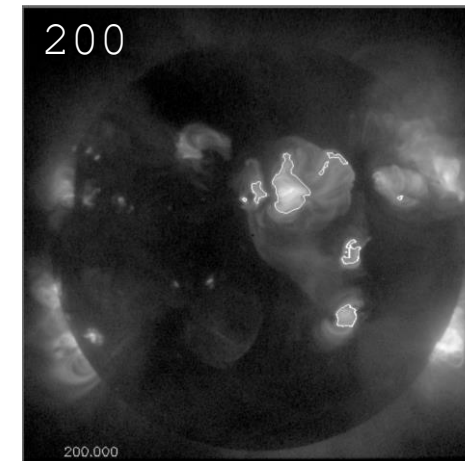
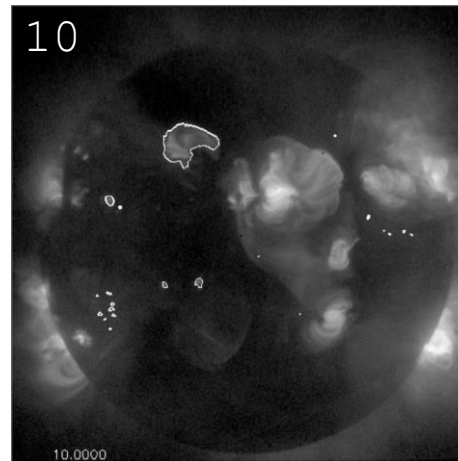
- Expand data regions to check parameter dependency
- Plot between XBP (X-ray bright points) and AR (active region)

Relationship between X-ray luminosity and magnetic flux



# Current Progress

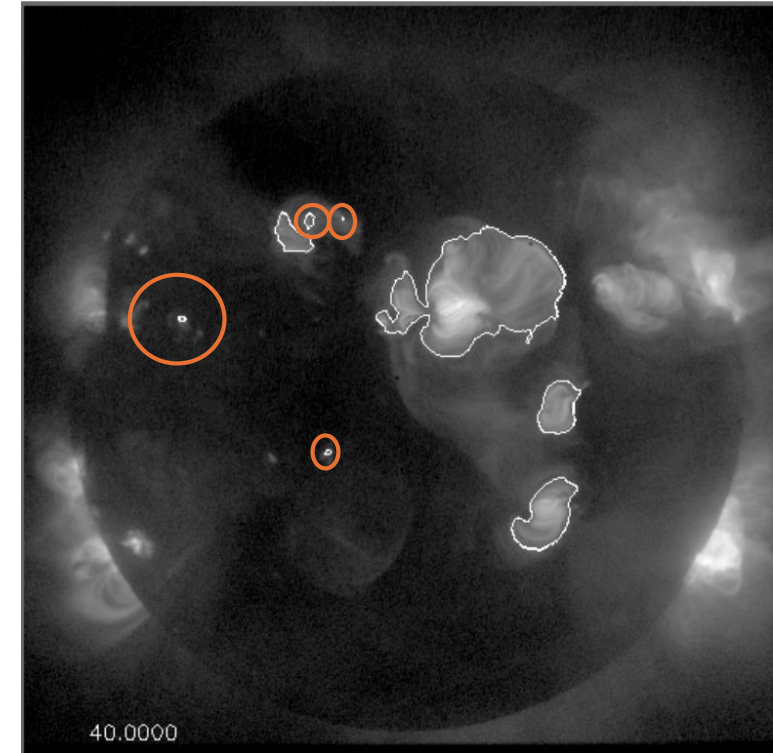
- Now use composite images
- Composite image formed from short, medium, and long exposure lengths
- Removed compromised data (saturated/missing pixels)
- Threshold values selected to use 40 and 50
- Applied threshold values to identify ARs for entire data set for XRT
- Images taken 6/21/2022





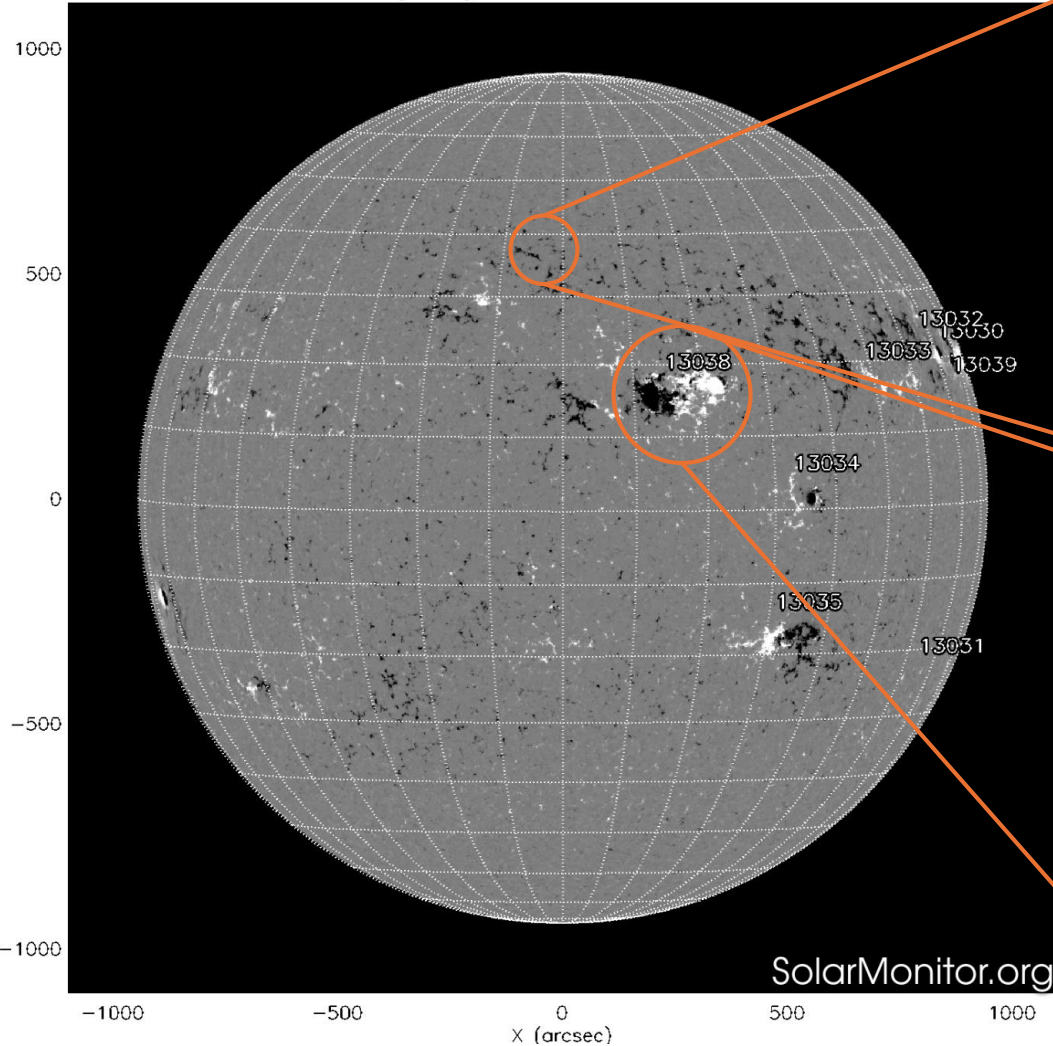
# Current Progress

- Incorporated HMI data
- Projected the selected ARs onto HMI and calculated the total magnetic flux
- Threshold selects using x-ray intensity so non-ARs could be selected
- Use HMI data to further filter data

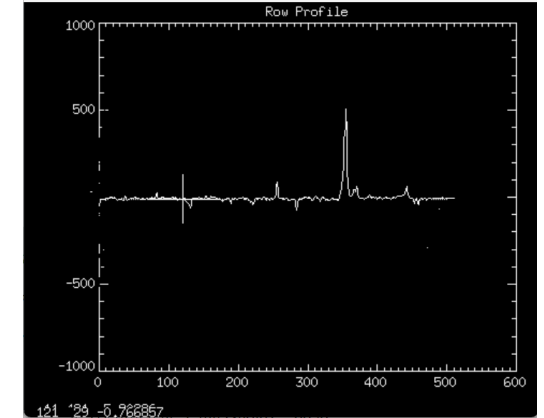
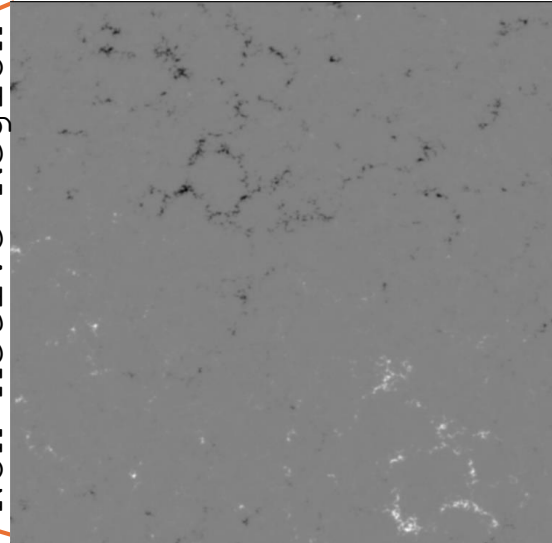


# What Does an Active Region Look Like Using HMI Image, What isn't an AR?

SDO HMI Magnetogram 21-Jun-2022 17:58:46.000

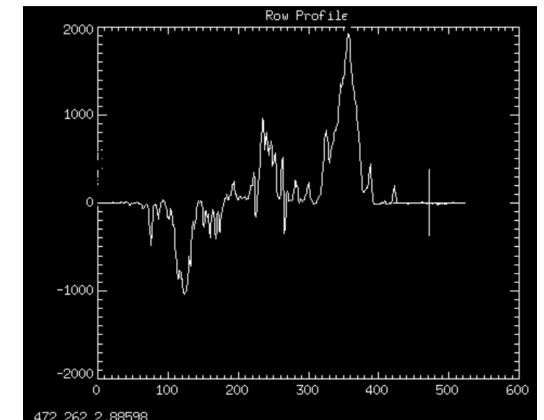
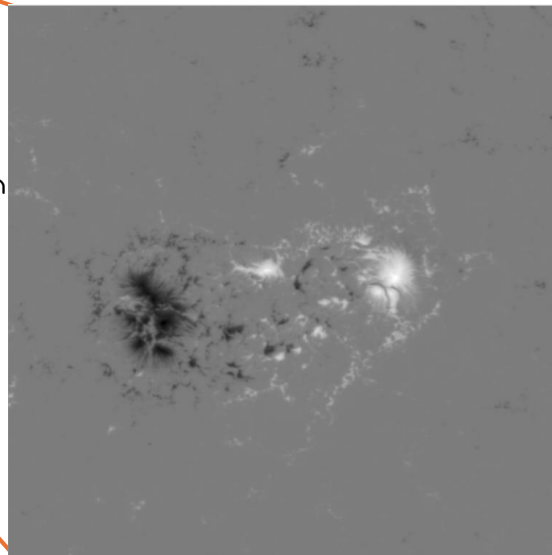


Non-Active Region



Spike ~500 gauss

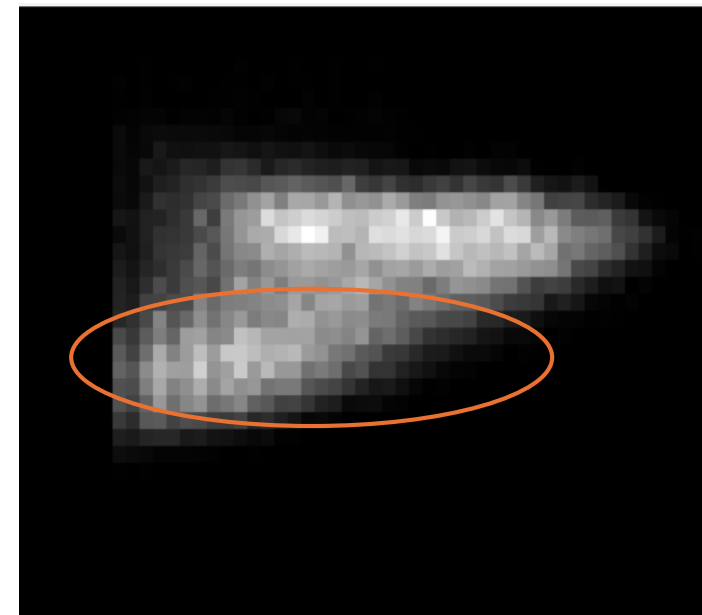
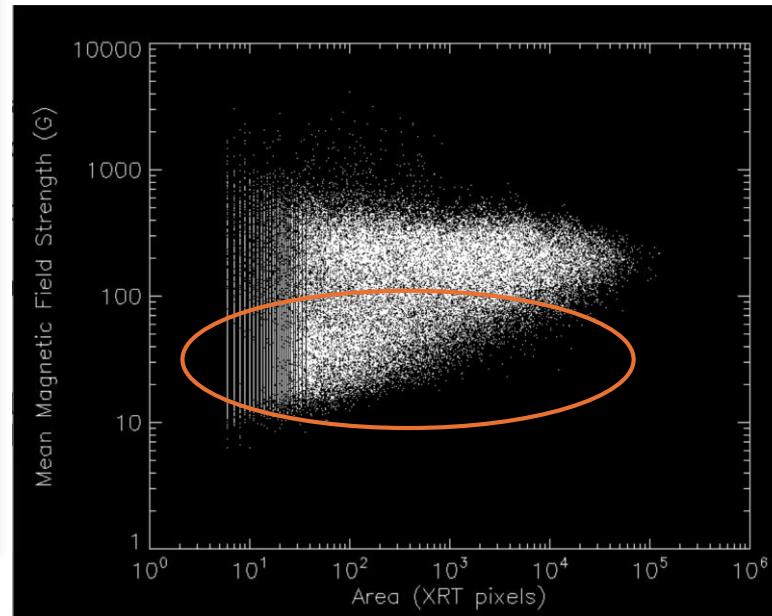
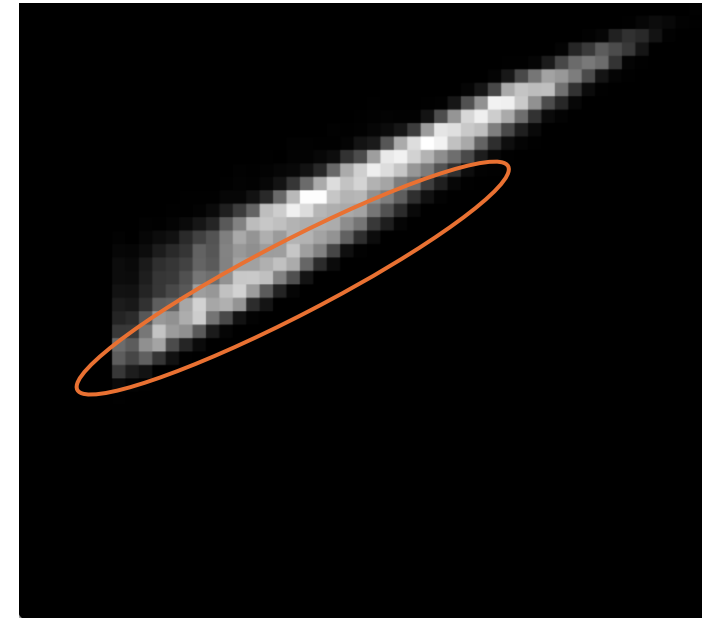
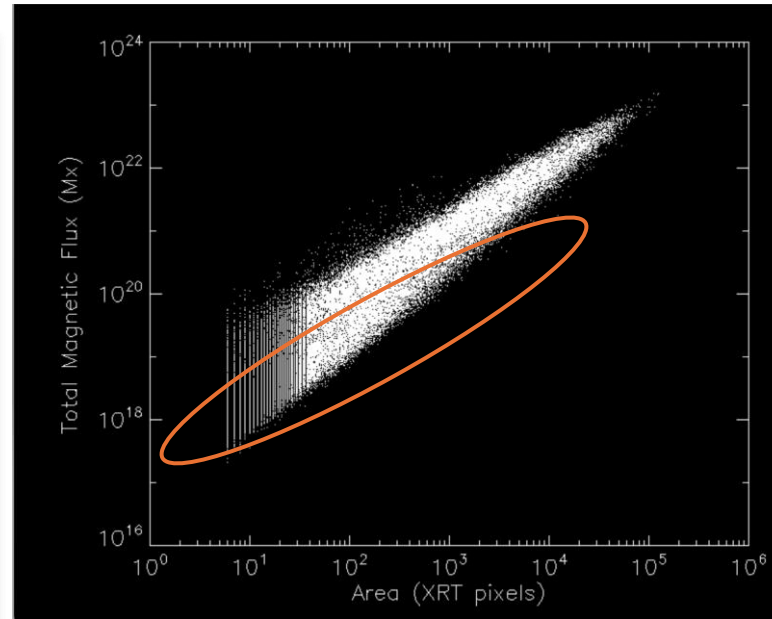
Active Region



Spike ~2000 gauss

## Current Progress Continued

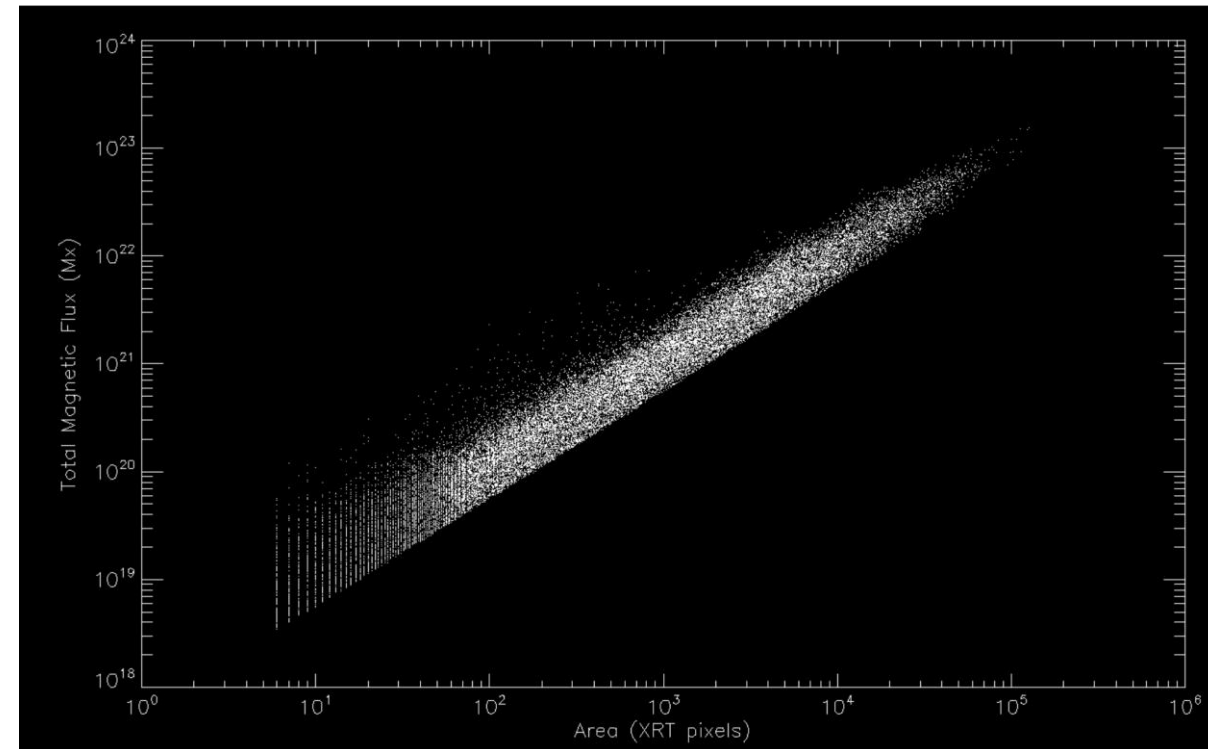
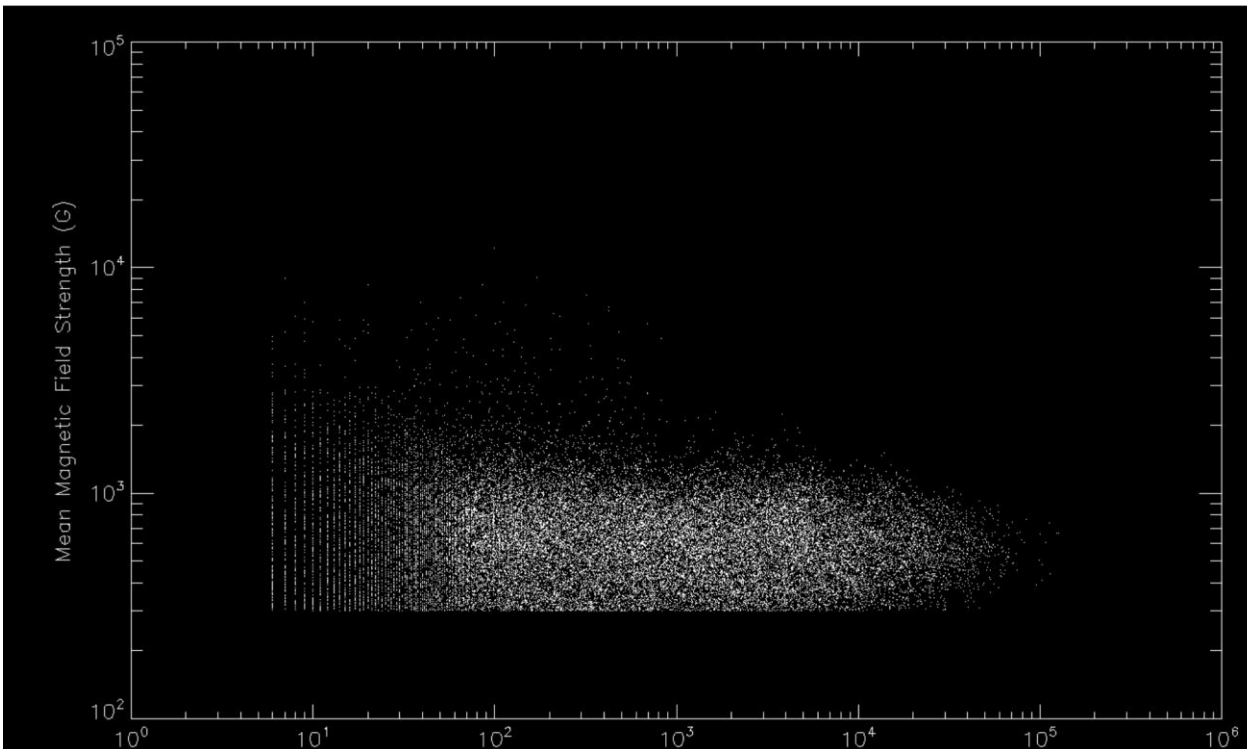
- Graphed total magnetic flux against area
- Graphed Mean magnetic field strength against area
- 2d Histograms
- Data includes QS (quite Sun ) and AR data





# Current Progress Continued

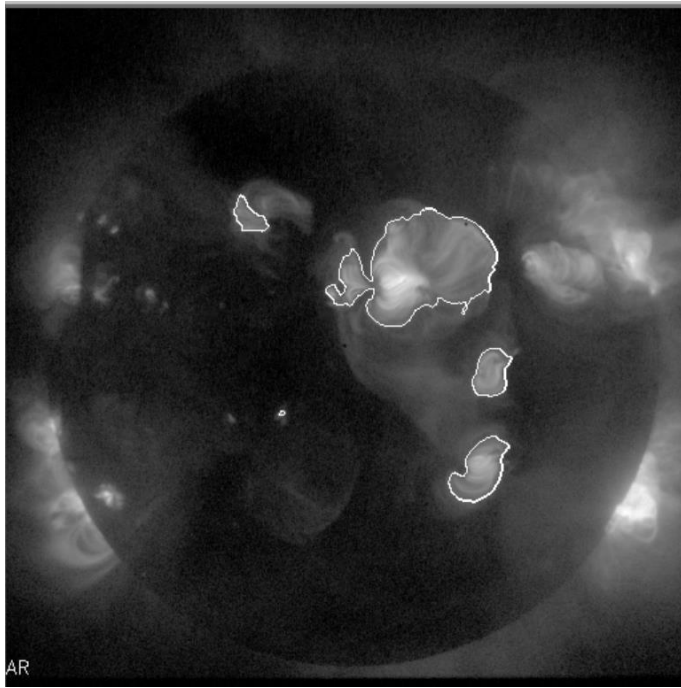
- Removed QS data (100 gauss filter applied)



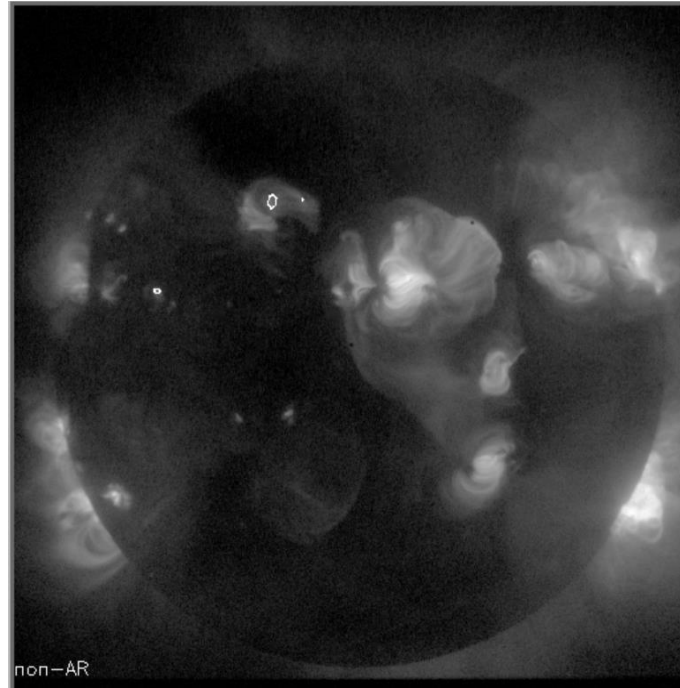
# Current Progress Continued

- Applied 100 gauss filter to help further improve selection of ARs
- Images taken 6/21/2022

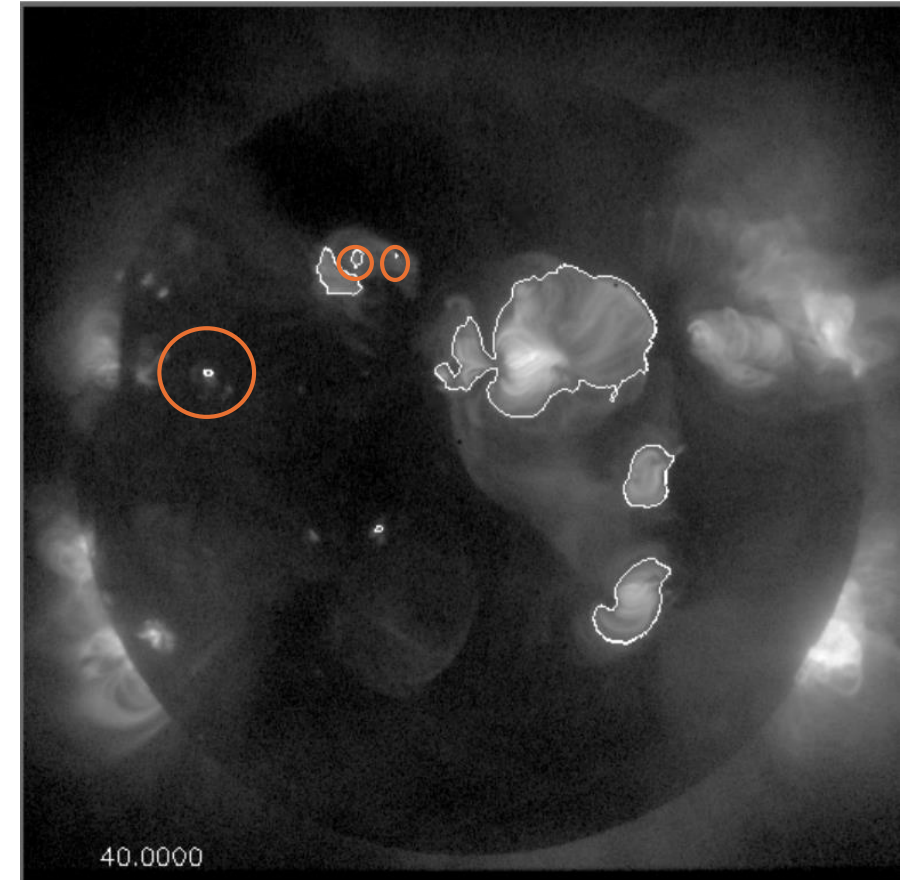
Improved Selection After Filter



Designated Not An AR After Filter



Before Filter



# Next Steps

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- Apply filter to the rest of the data
- Apply another filter to improve AR selection by removing unipolar regions
- Going back to XRT data to find temperature, and emission measure





Questions?

