# FOXSI-1 Data and Analysis Update

October 2013

# Topics

- Coregistration and alignment
- Flare imaging
- Blanketing absorption characterization
- Quiet Sun work
  - QS photon estimates
  - Spatial analysis
- Active region work
  - Update from Ishikawa
  - FOXSI simulations of low vs high freq heating

# Public Service Announcement

- Don’t be afraid to work with the data!

- Once the FOXSI directories are installed, looking at a FOXSI image can be as easy as:

- @foxsi-setup-script
- ; choose a target (example: flare)
- get_target_data, 4, d0,d1,d2,d3,d4,d5,d6, /good
- ; make an image for detector 6
- img=foxsi_image_solar( d6, 6, psize=10, thr_n=4., /xycor)
- ; map and plot it.
- plot_map, make_map( img, dx=10, dy=10 ), cen=flare, fov=2

# Coregistration and alignment

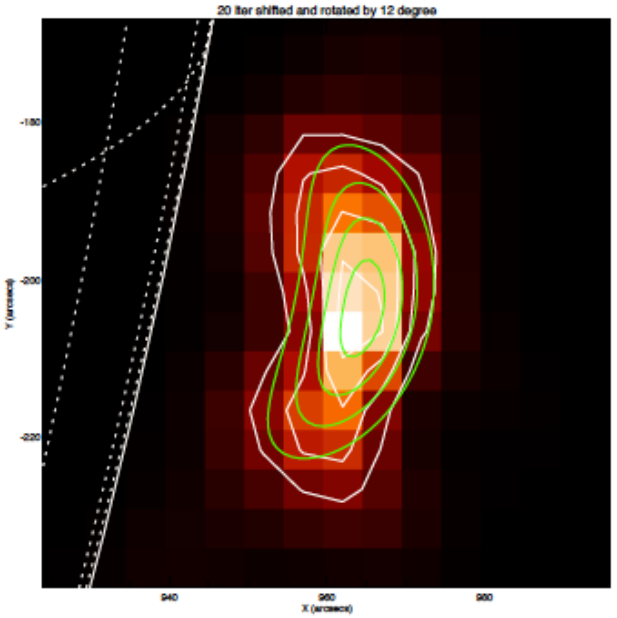
- Translational alignment
  - Align flare centroids with RHESSI centroid
  - Done, and implemented as keyword in imaging functions: /xycor

- Rotational alignment – methods:
  - Align flare orientation with RHESSI (best so far)
  - Use flare off-pointing tracks (started but not finished)
  - Examine c-stat for deconvolution for various rotation angles of the source about its centroid.

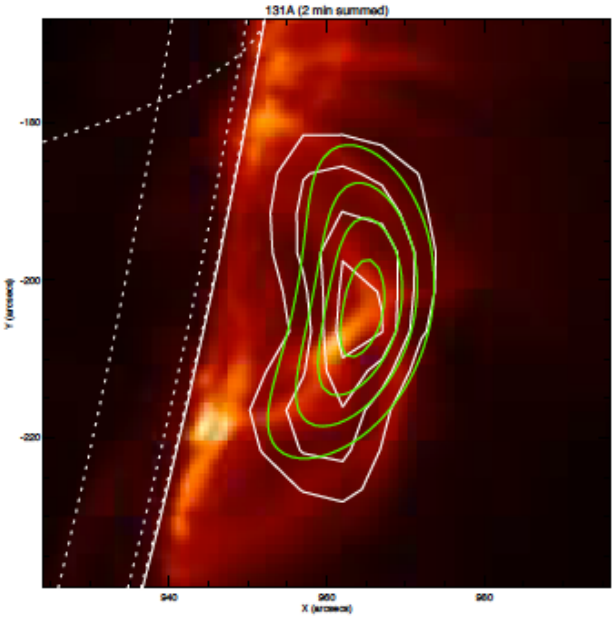
- Overall detector (coarse) geometry has been checked using flight data (flare) and postflight alignment images.

# Flare imaging

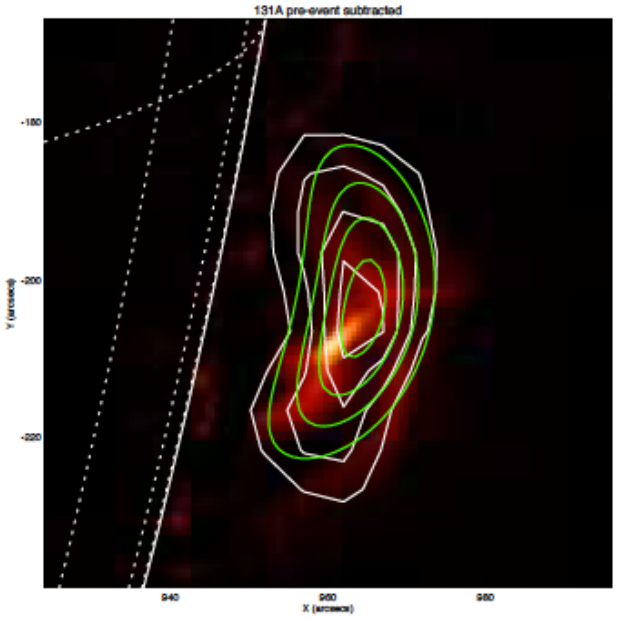
- Max_likelihood deconvolution has been fairly successful:




Background: FOXSI D6
White: FOXSI D6
Green: RHESSI (method?)



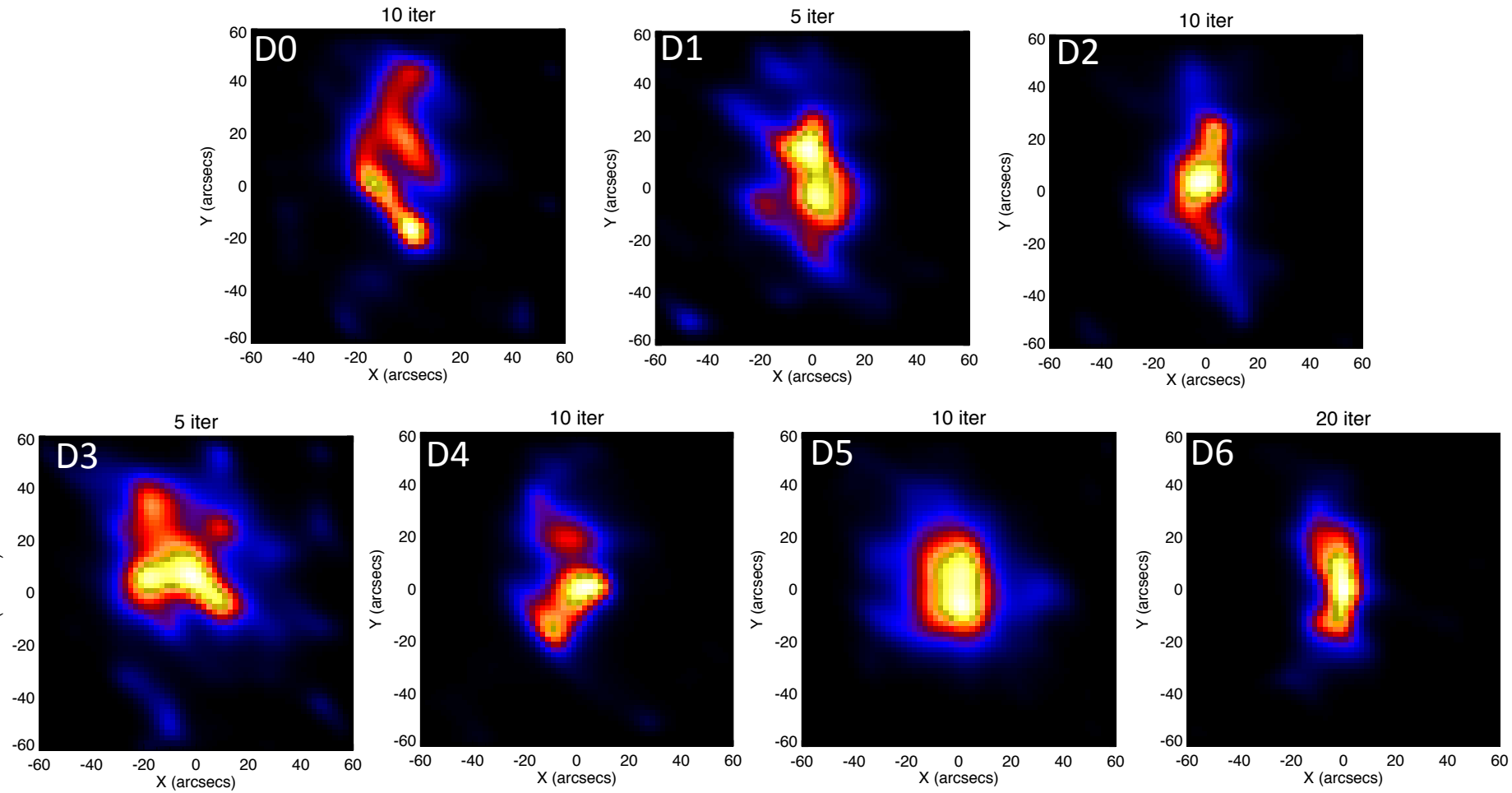

Background: AIA 131A



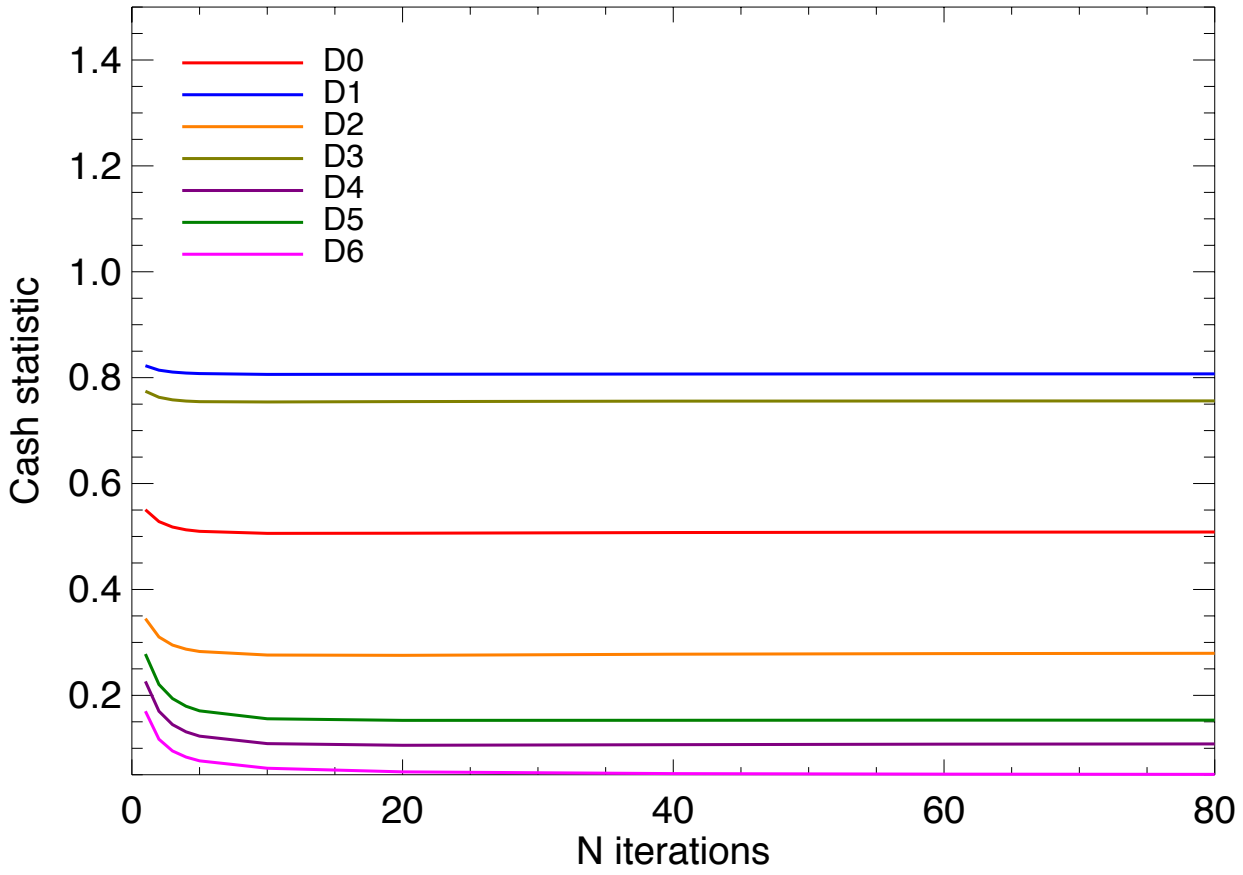

Background: AIA 131A with preflare subtraction

# Flare imaging

- …though D6 results are by far the best!



# Flare imaging




| Det | N photons |
|---|---|
| 0 | 558 |
| 1 | 198 |
| 2 | 953 |
| 3 | 267 |
| 4 | 1750 |
| 5 | 1841 |
| 6 | 2006 |

# Flare imaging

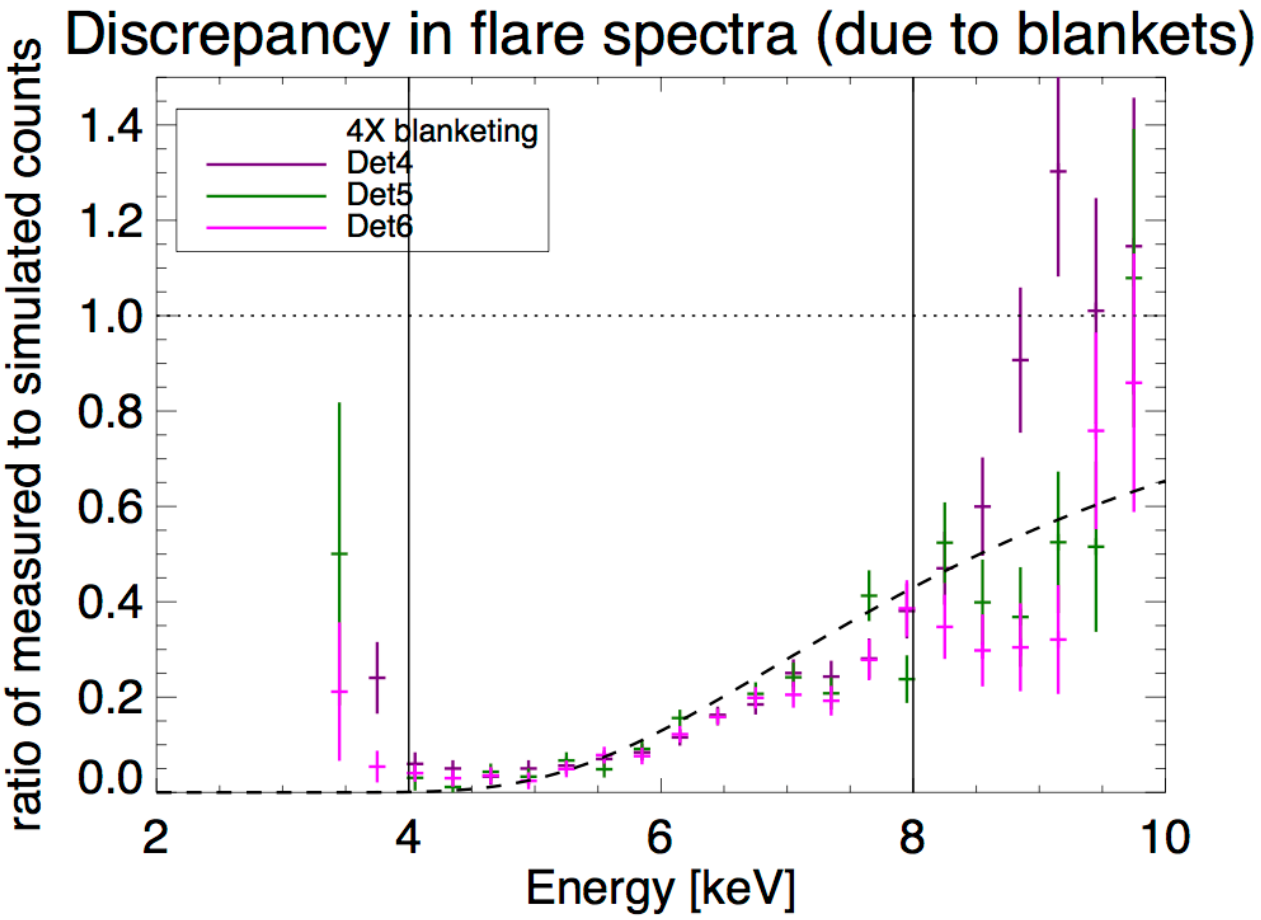
- To do:
  - Try FOXSI CLEAN method (started)
  - Try other PSFs:
    - Estimate off-axis angle (and direction!) for each optic using alignment images.
    - Run the deconvolution with PSF closer to those estimates, if we have them.
    - OR, deconvolve for many simulated PSFs and look for a min C-stat.

# Blanketing absorption characterization

- *All* detectors have some extra blanketing in front of them.
- "Puff test" showed that inflated blankets can essentially fill the tube fairly easily.
- D6 (the best count rate and image) is in the center; it's possible there could have been a small blanketing gap in front of it.

# Blanketing absorption characterization

Most recent results:  (From March!)



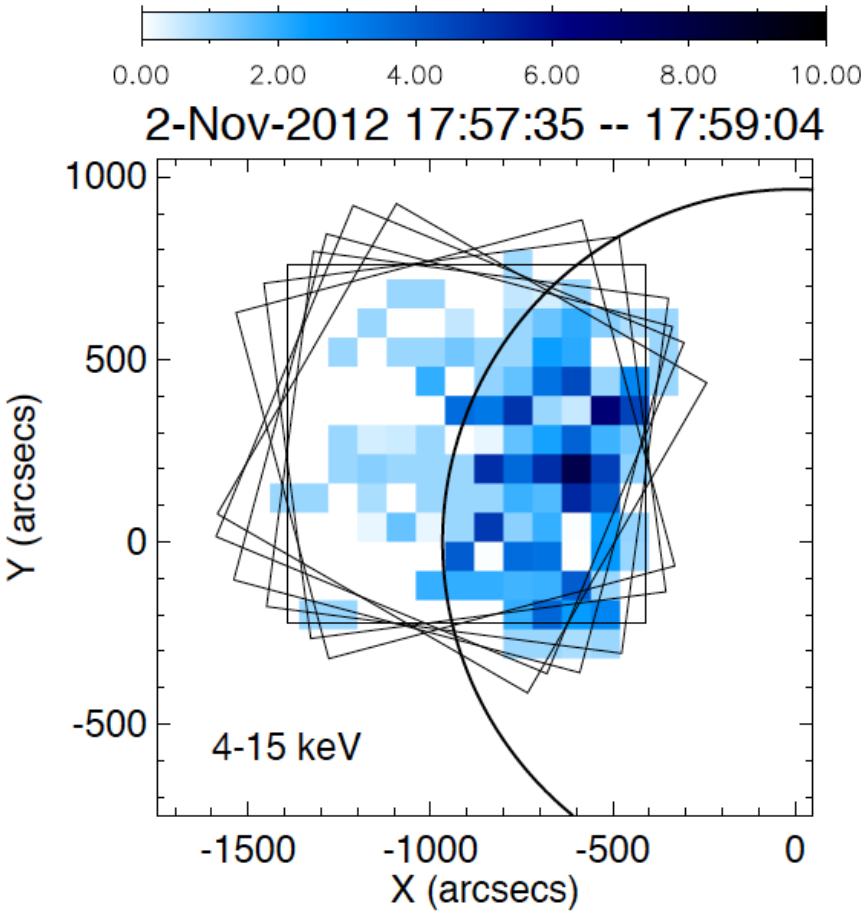
# Blanketing absorption characterization

To do:

Try redoing RHESSI spectra with some variations, like reducing the blanket absorption in the DRM. See if we find a better fit. **Started, but suspended for technical troubles.

# Quiet Sun work

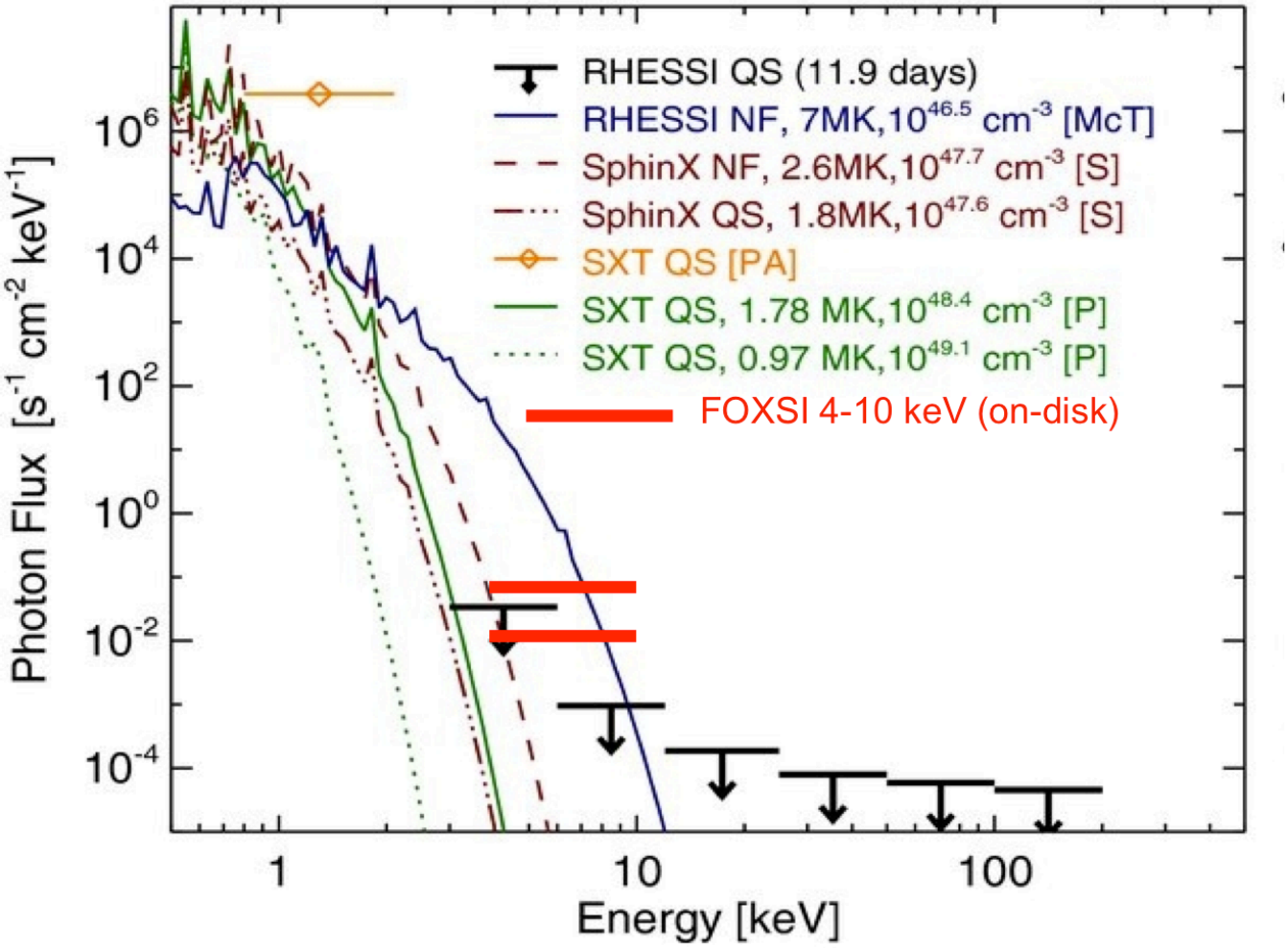
- 2nd target shows greater flux on-disk than off.



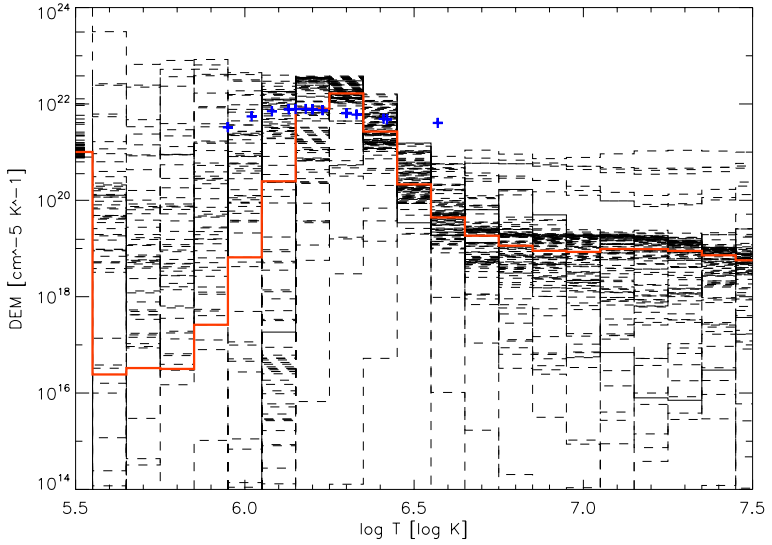
# Quiet Sun work

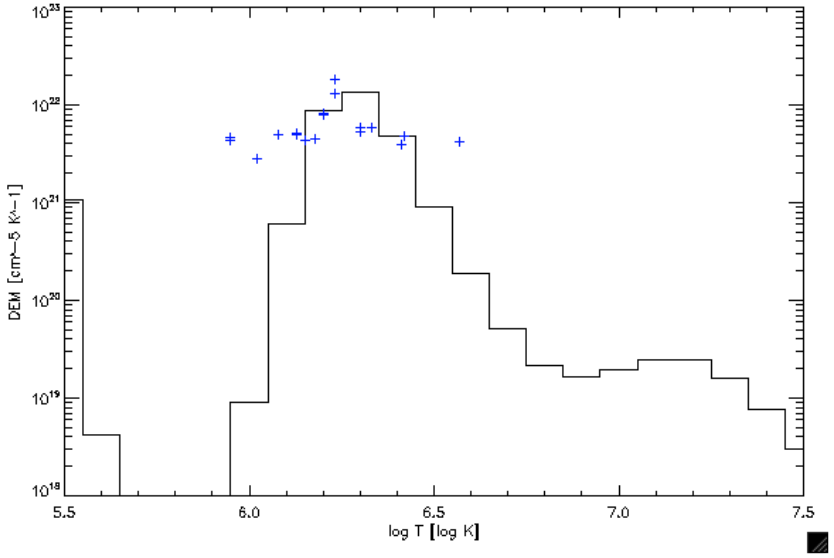
- To do:
  - Investigate single-bounce photons
    - probably requires ray tracing
  - Calculate quiet-Sun HXR flux assuming our counts are real.
    - First, very rough, estimate done (see next slide). More refined calculation should be done.
    - Probably should first exclude counts in the vicinity of the AR.
  - Comparison of quiet Sun counts with AIA and XRT.
    - Not started, except for a quick by-eye comparison.

# Quiet Sun work



# Active region temperatures




- DEMs produced for AR in first target using EIS and XRT data.
- FOXSI sensitivity curves (not shown) will constrain the high-temperature part.
- This analysis is nearing completion.

# Simulations of AR heating

- Winebarger and Warren are simulating low- vs high-frequency heating of active regions.

- They produce DEMs for these two cases and simulate observations from MAGIXS to see if it can differentiate between them.

- At their request, FOXSI simulations have also been produced.

# Simulations of AR heating -- FOXSI