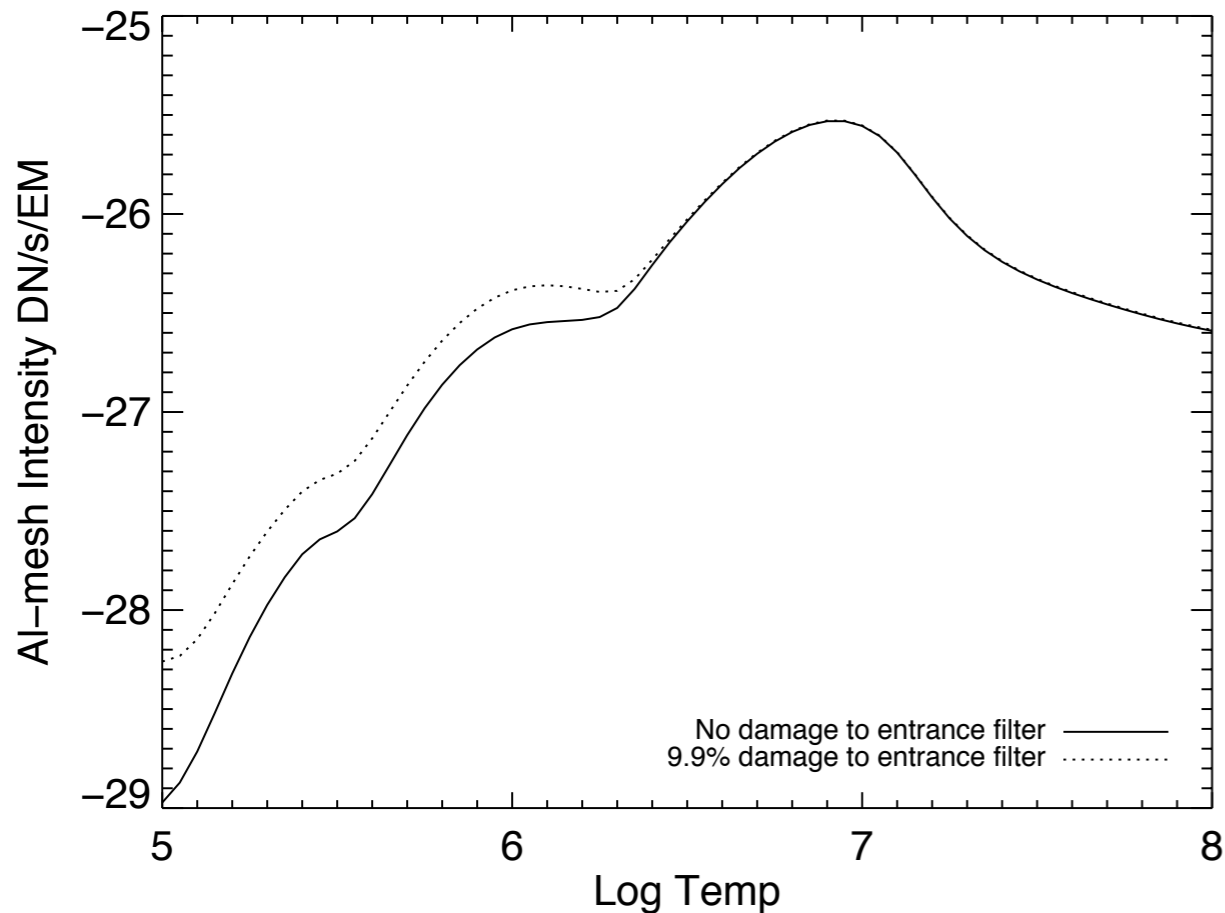


XRT calibration after light leaks

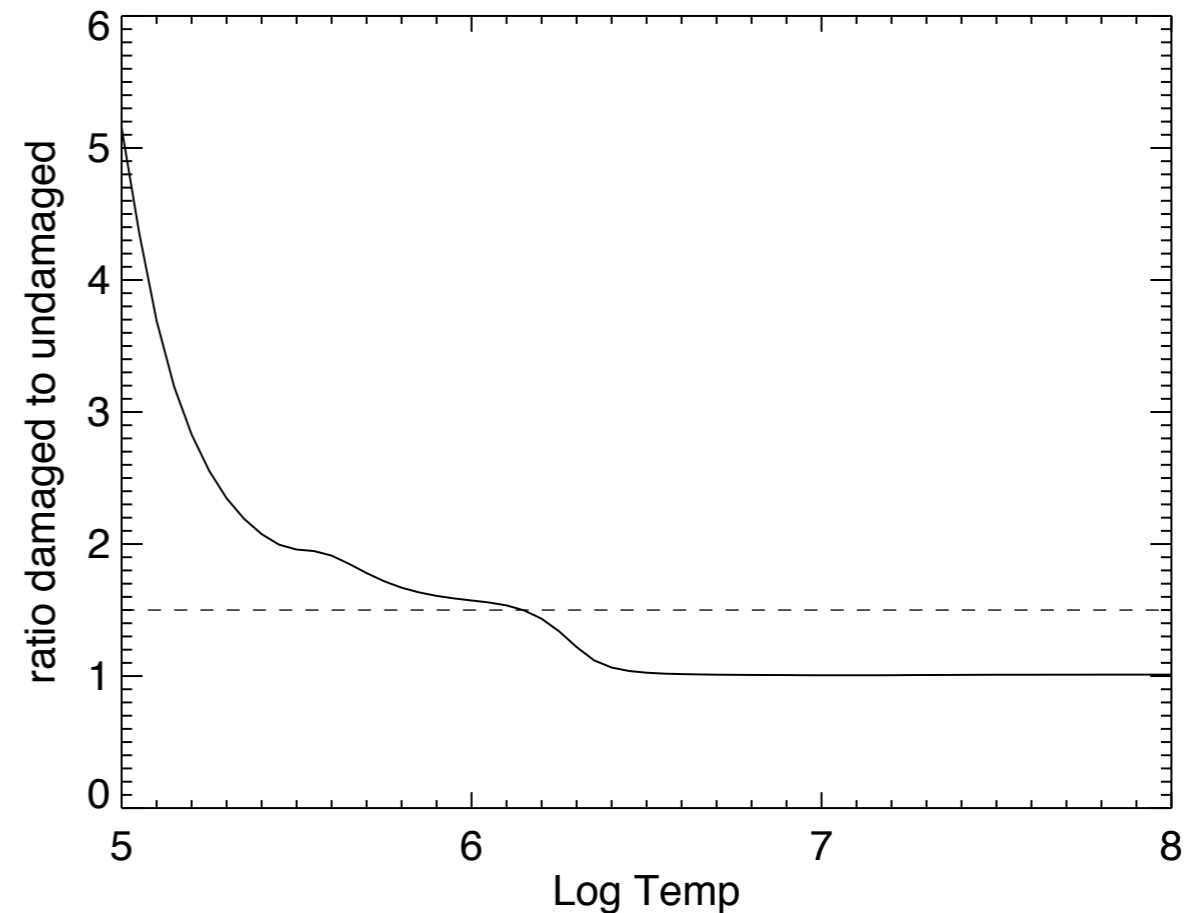
Kathy Reeves

Comparison of Al-mesh pre-light leak and phase 4

Assuming increase in Xray transmission is the same as visible light

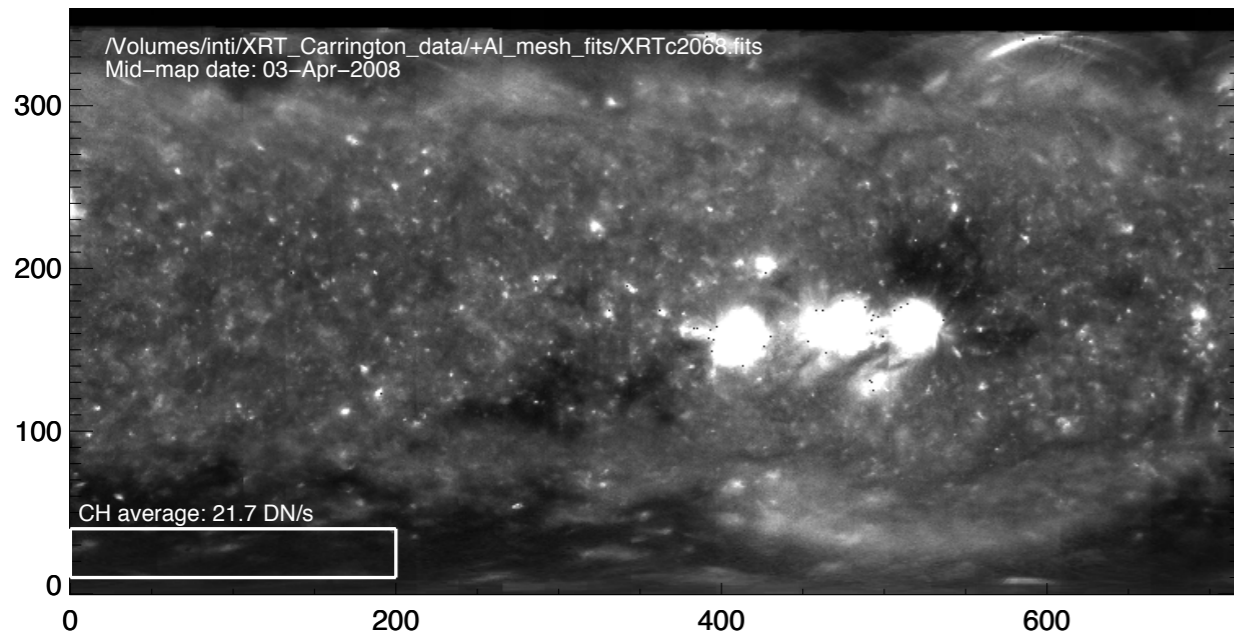


Damage to entrance filter primarily affects cooler temperatures, increasing the temperature response there. Response functions calculated using Chianti 9

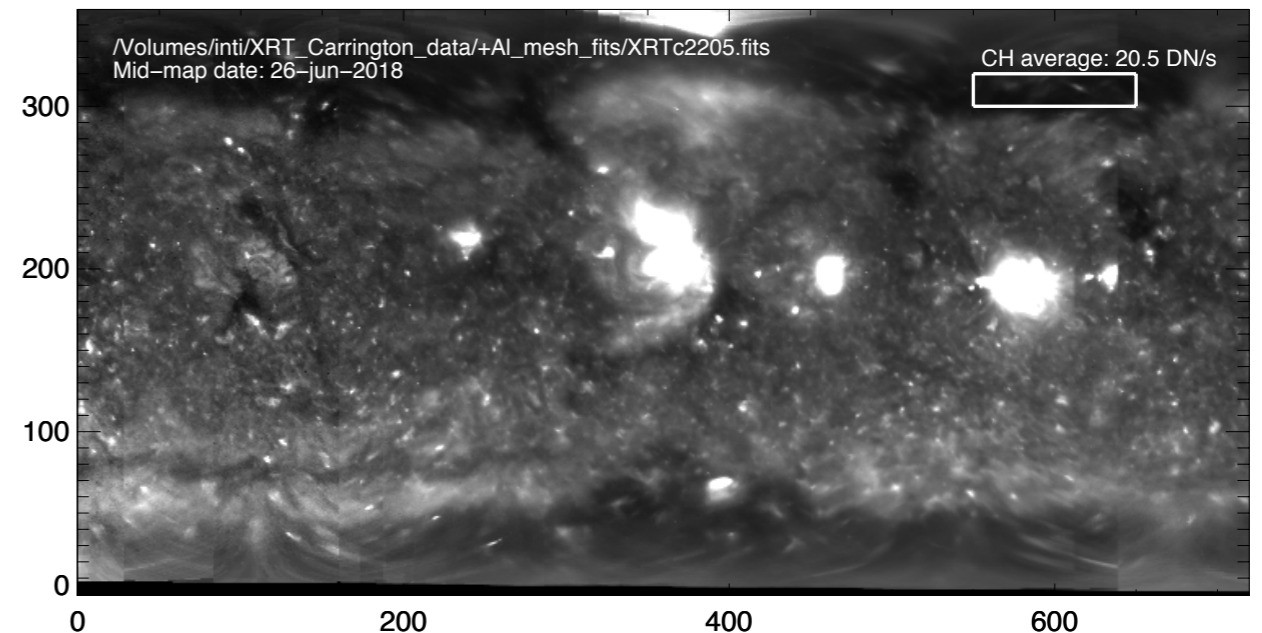


At LogT = 6 (1 MK), ratio of damaged to undamaged is 1.5. Ratio is higher for lower temperatures. At about LogT=6.4, ratio is ~1.

AI Mesh Carrington maps from pre-light leak and phase 4



Pre-light leak: 03-Apr-2008
Average counts in the CH: 21.7 DN/s

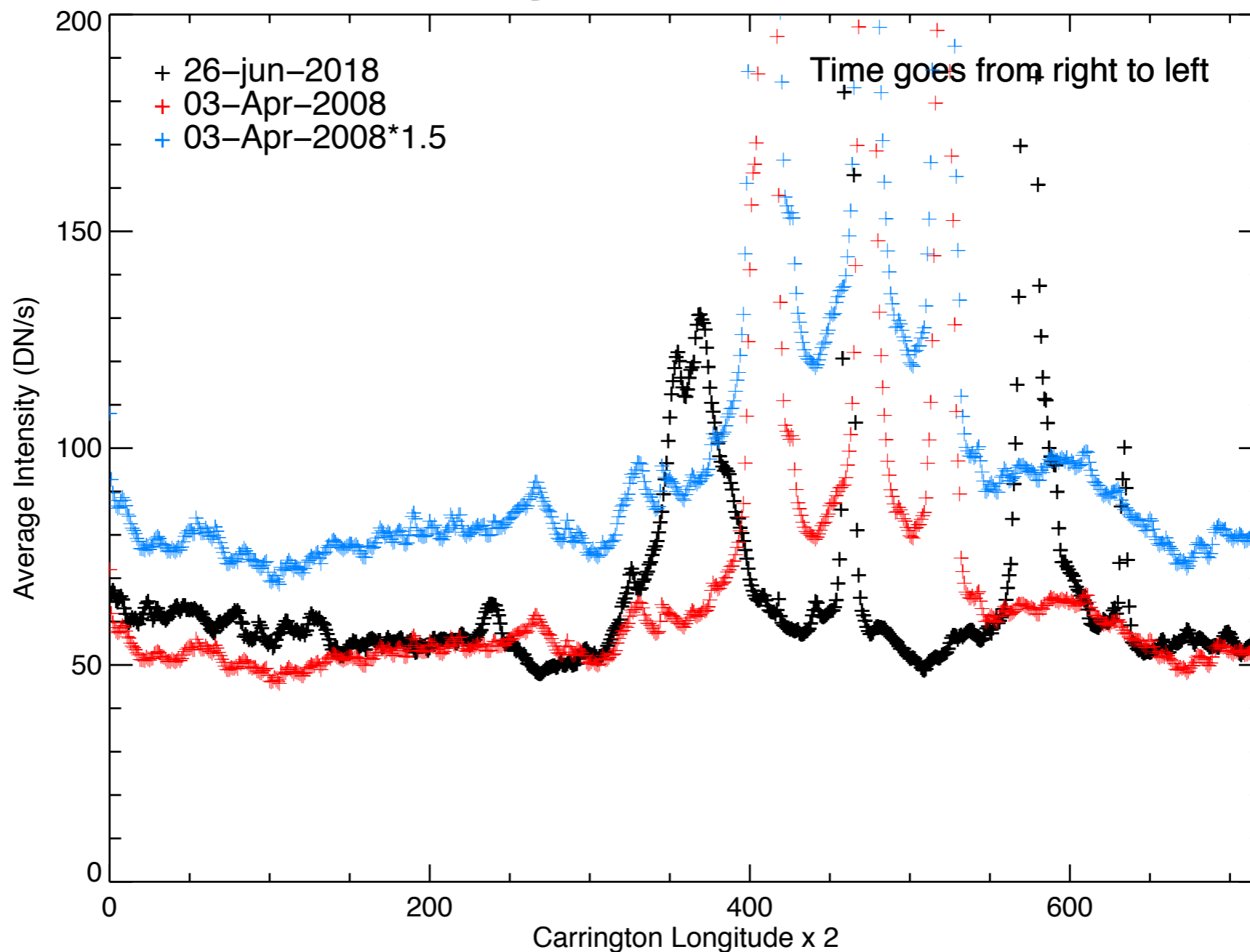


Phase 4: 26-Jun-2018
Average counts in the CH: 20.5 DN/s

Carrington maps derived from images that have been xrt_prepped, exposure time normalized, and light-leak corrected. No other calibrations have been applied.

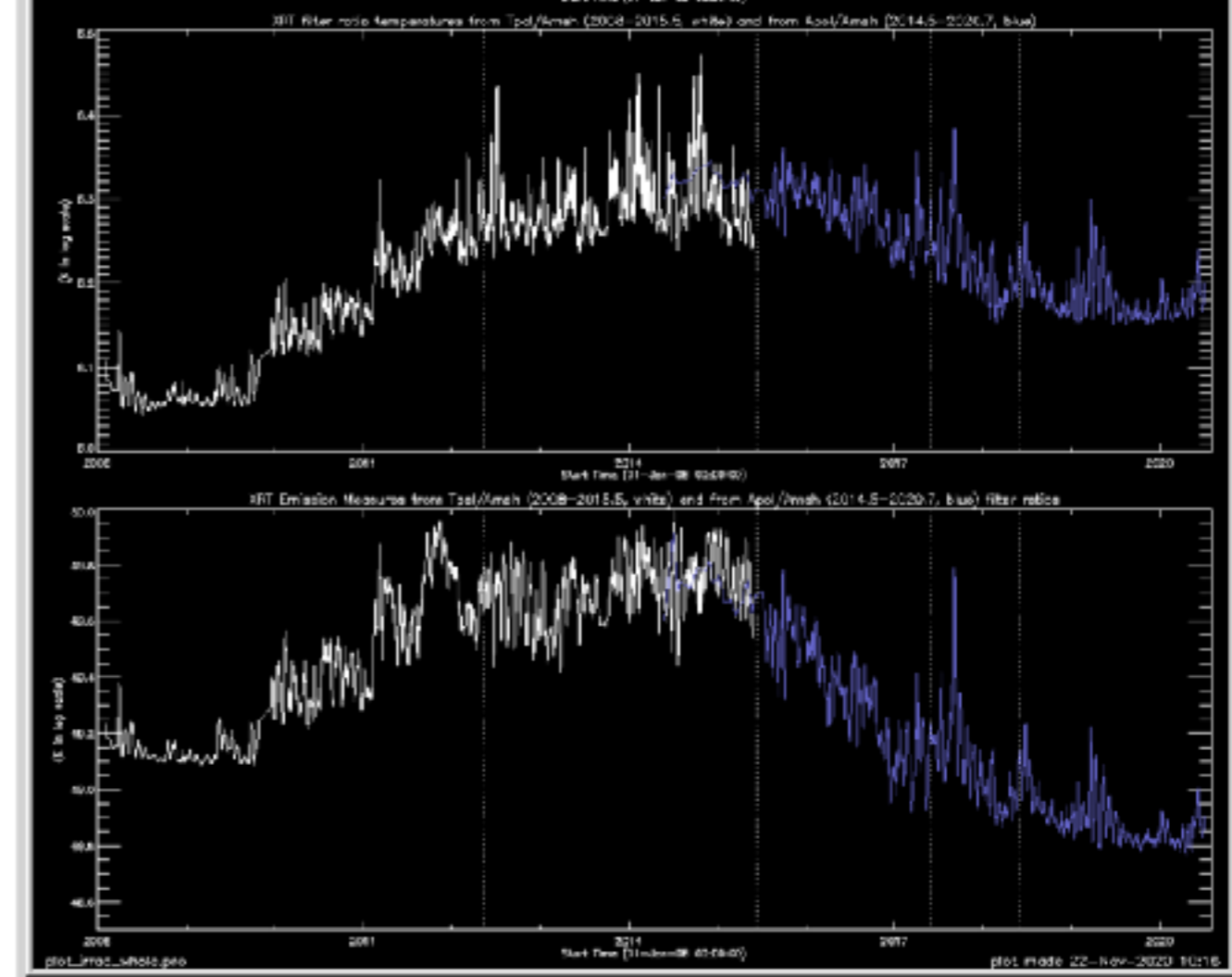
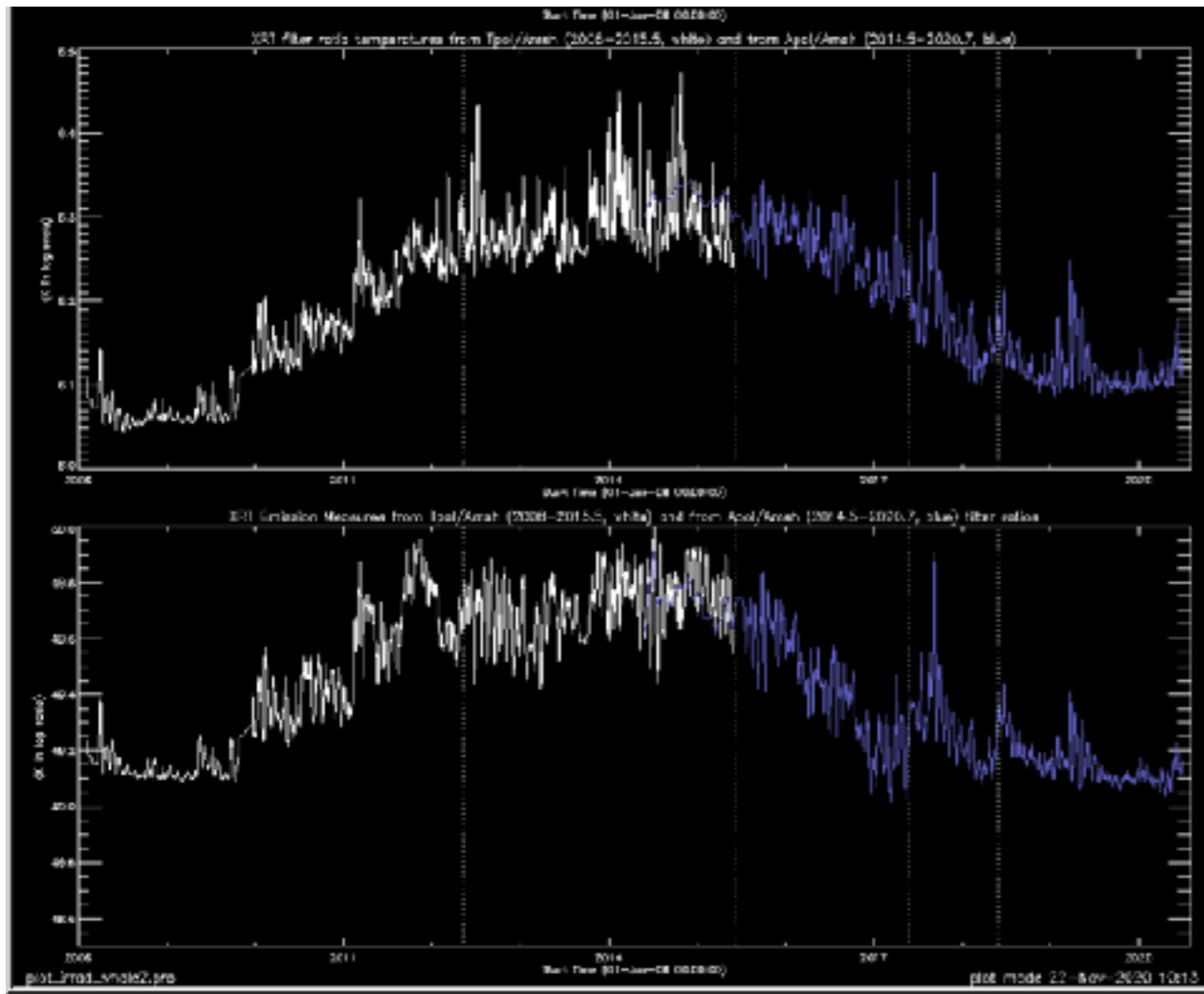
Average counts in the CH regions are very similar, without correcting for increased Xray transmission in entrance filter due to hole.

Average intensity from Carrington maps



Both Carrington maps have relatively quiet regions at < 300 pixels and >650 pixels. There does not seem to be an increase in emission in quiet regions due to hole in entrance filter in Phase 4.

This finding agrees with Aki's results



No correction other than visible light leak removal (i.e. no response function correction)

Response functions corrected for opening in entrance filter, assuming visible light opening is the same as X-ray opening

Temperature and emission measure of 2019-2020 solar minimum is more consistent with 2007-2008 solar minimum with no X-ray light leak correction applied.

Question to engineers: Are there any scenarios that would cause a light leak in the visible in XRT, but not in the X-rays?

- Possibility 1: It is possible that entrance filter holes cause higher apparent visible light open area than X-ray open area, because of differences in how white light and X-rays scatter in the telescope
- Possibility 2: The visible light shutter is not completely closed when commanded, which would let in visible light, but not X-rays.

Conclusions

- Kathy's Carrington map intensity analysis agrees with Aki's filter ratio analysis in that the visible light leak correction alone seems to give good results.
- It is possible that the apparent open area for visible light in the entrance filters is bigger than the apparent open area for X-rays, or that the VLS is not completely closing.
- Using the visible light open area to correct the response of the entrance filters results in an overestimate of the extra X-rays coming through the telescope