Initial STIX Coarse Flare Locations

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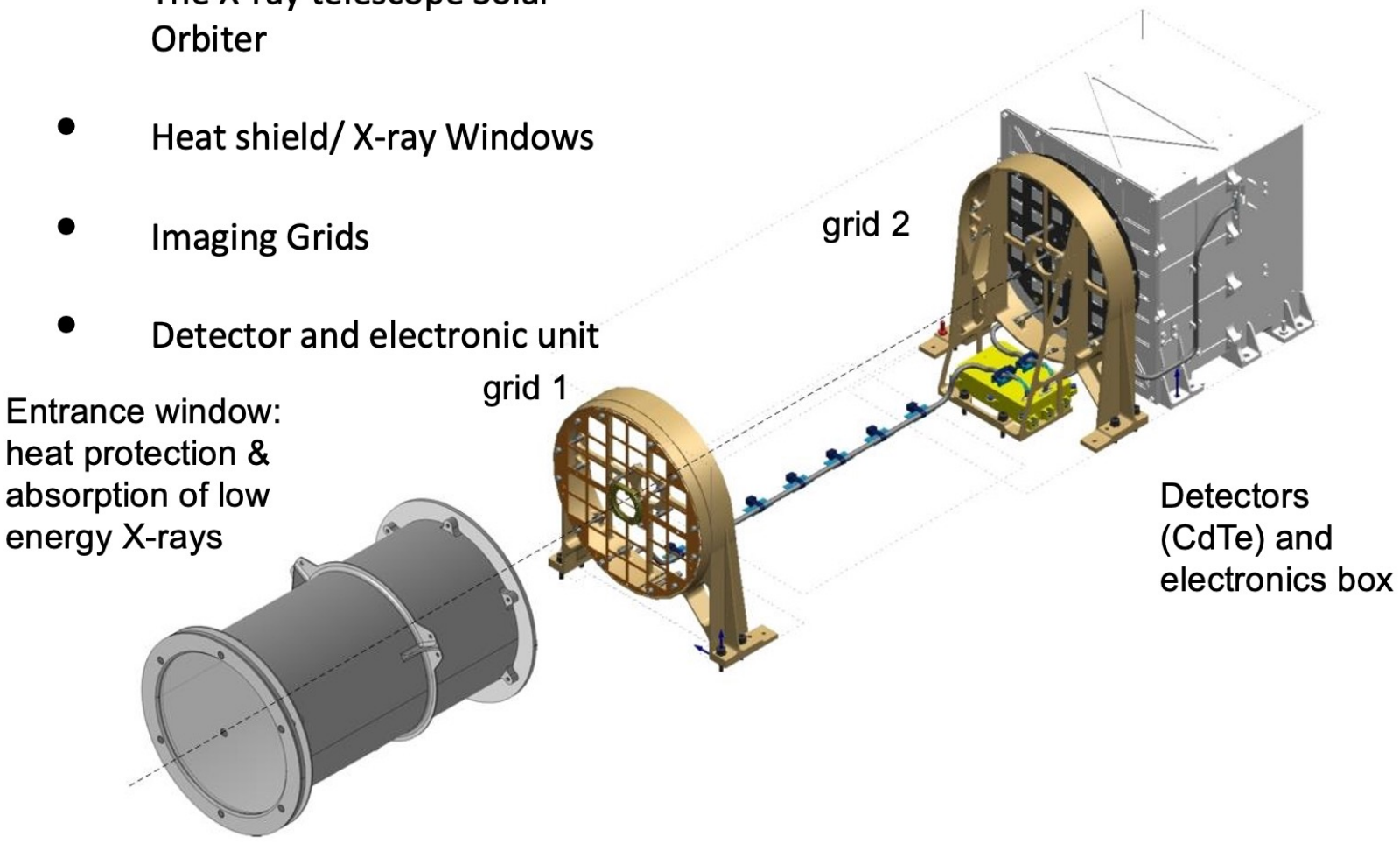
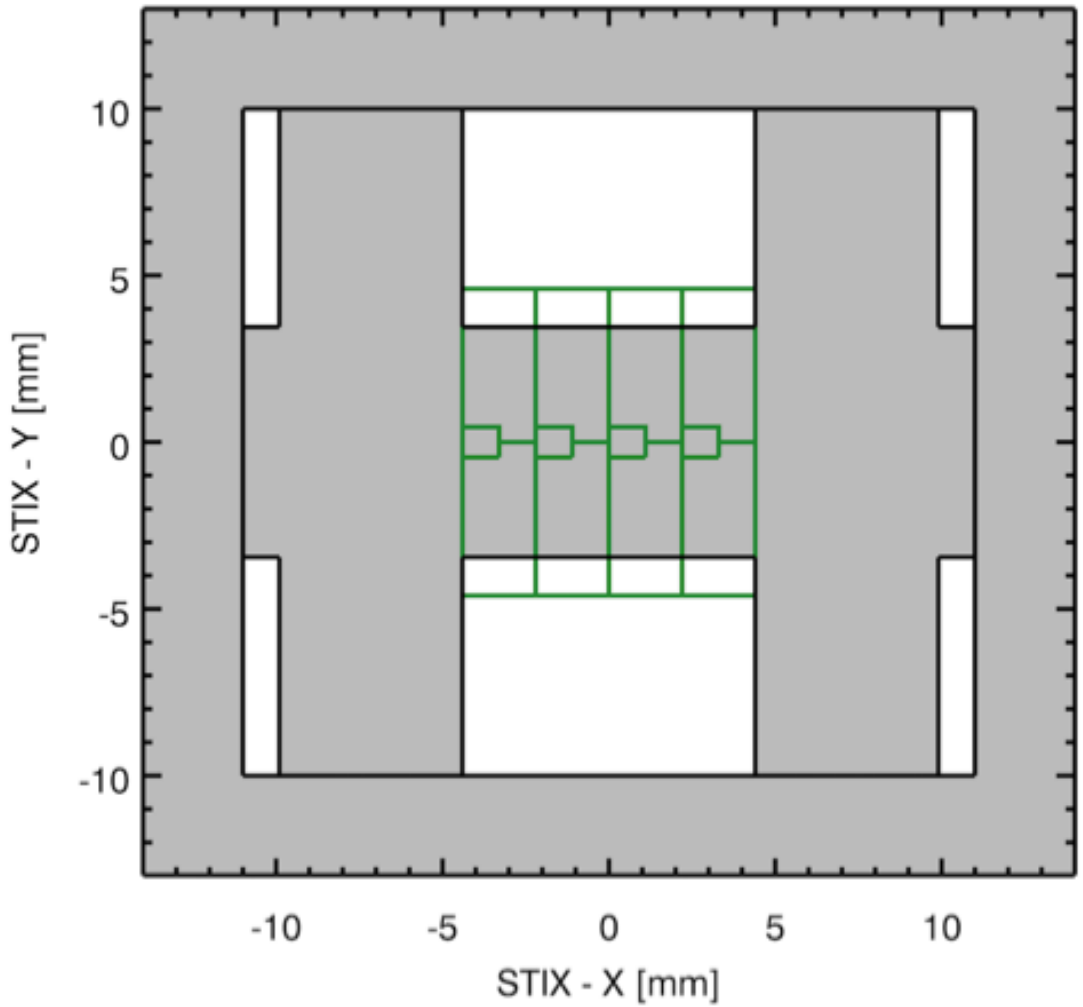
STIX (Spectrometer Telescope for Imaging X-rays)

- The X-ray telescope Solar Orbiter
- Heat shield/ X-ray Windows
- Imaging Grids
- Detector and electronic unit



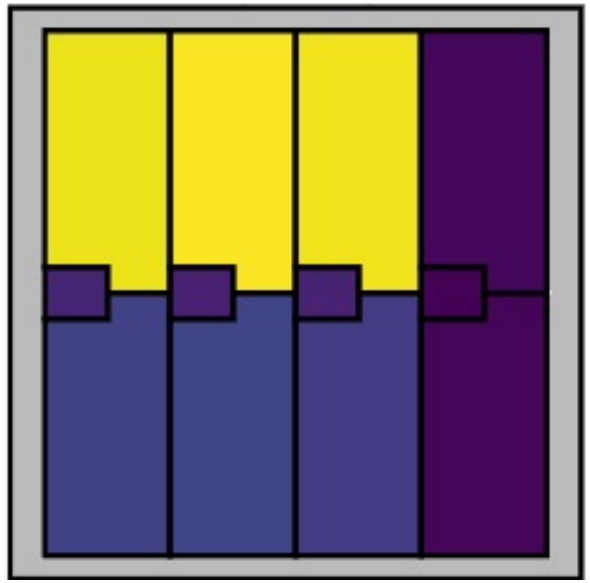
Coarse Flare Locations

- Dedicated detector for measurement of X-ray source location without imaging
- Locations can be reconstructed on ground using GSW when fully pixelized science data is available
- On board implementation reports values as part of STIX quicklook data
- Can potentially also be used in real time

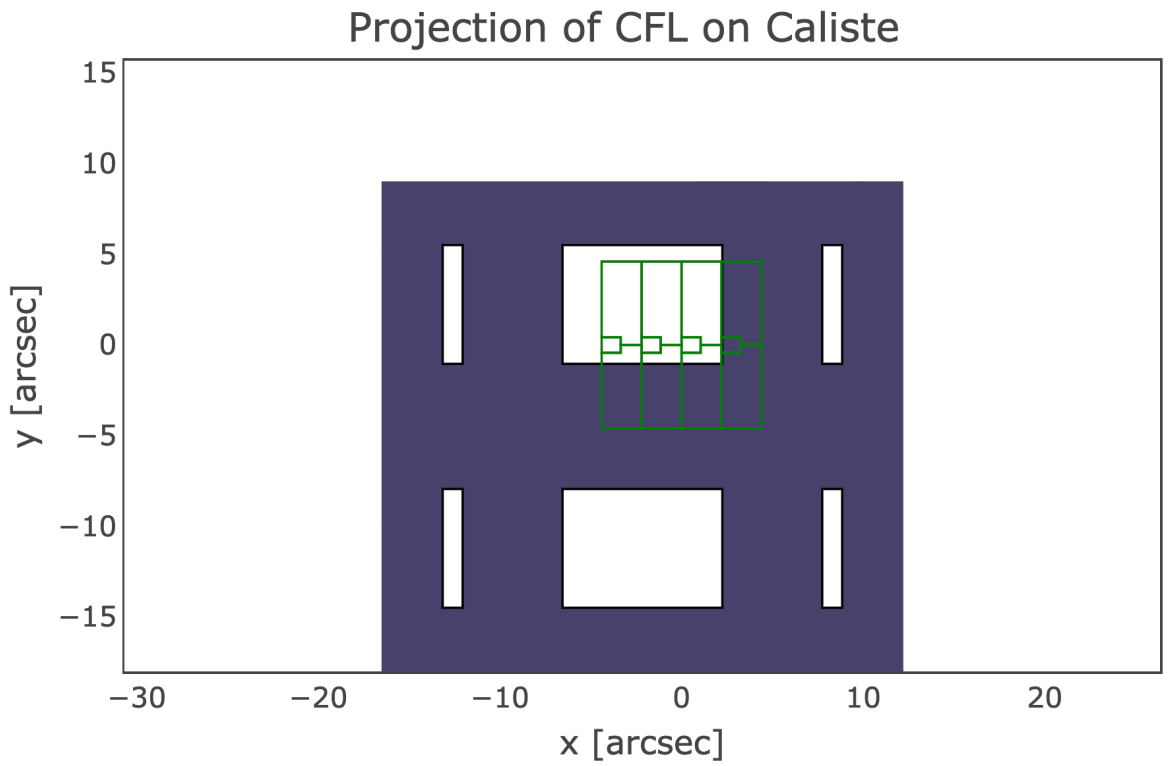


7th June 2020 B6 Event

- B6 flare observed during commissioning has sufficient signal to show clear pattern in CFL detector
- Location reconstructed on ground
- Energy and time ranges chosen to maximize signal
- Pixel dependent long duration background subtracted



CFL Detector Counts



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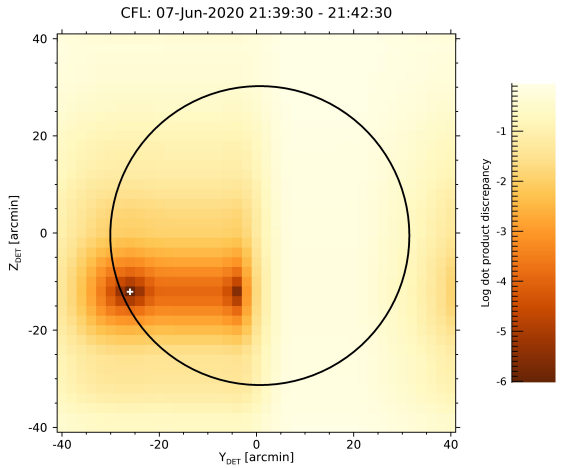
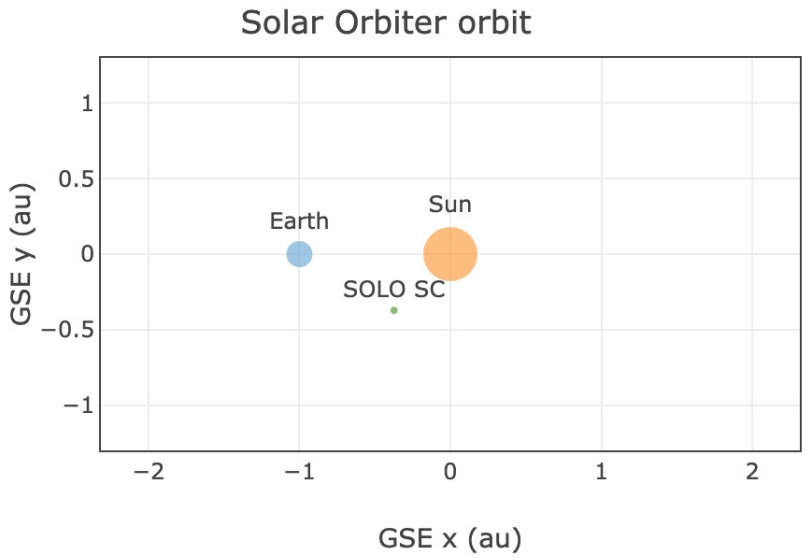
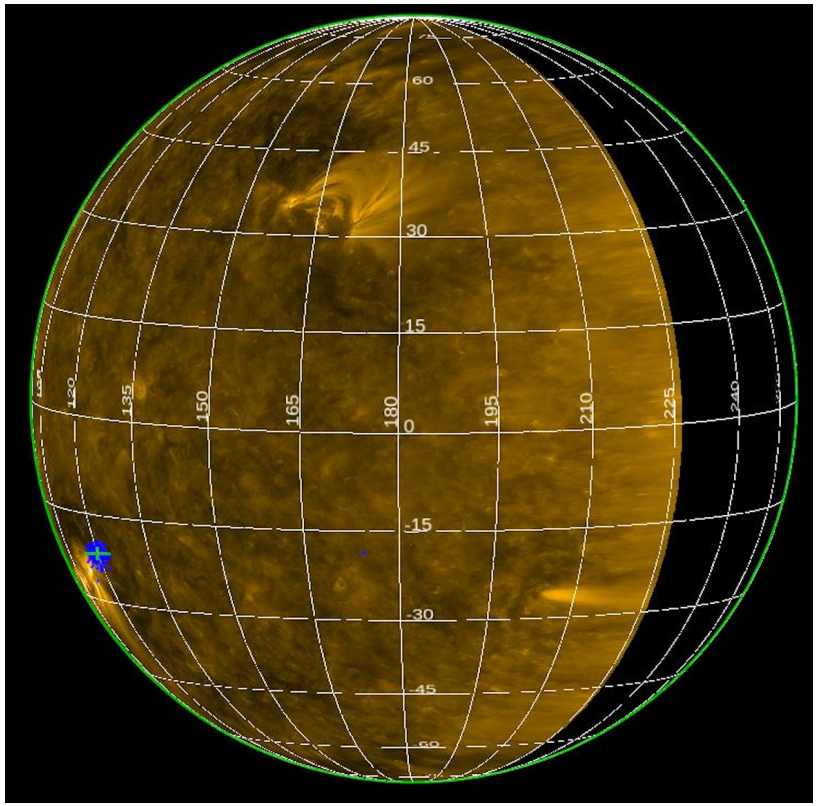
7th June 2020 B6 Event

- Further corrections such as STIX and spacecraft aspect solutions can be applied
- Orbiter-Earth separation ~ 45°
- Comparison with rotated AIA images shows good agreement with location of flaring active region







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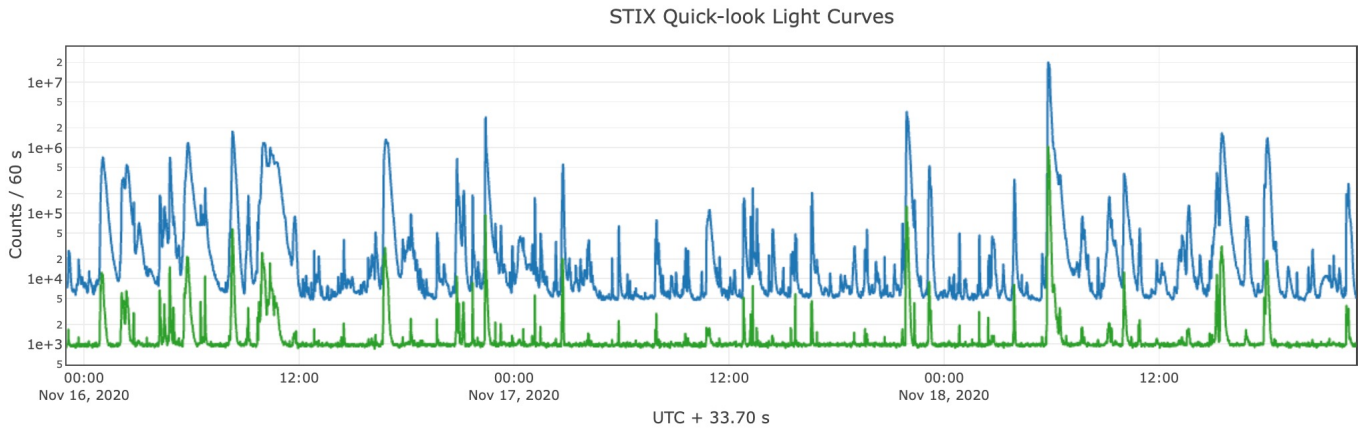
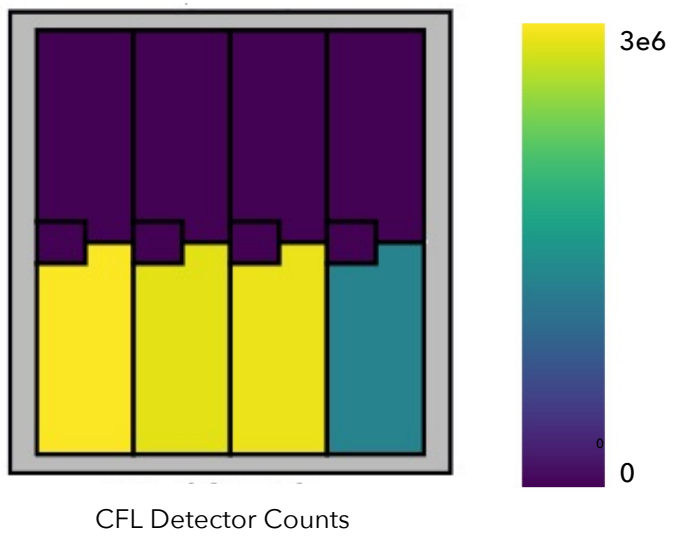
November 2020 Events

- Large number of sizable flares detected when STIX was observing in November 2020
- These show a distinctly different pixel pattern suggesting a distant location on the Sun compared with the June B6 event

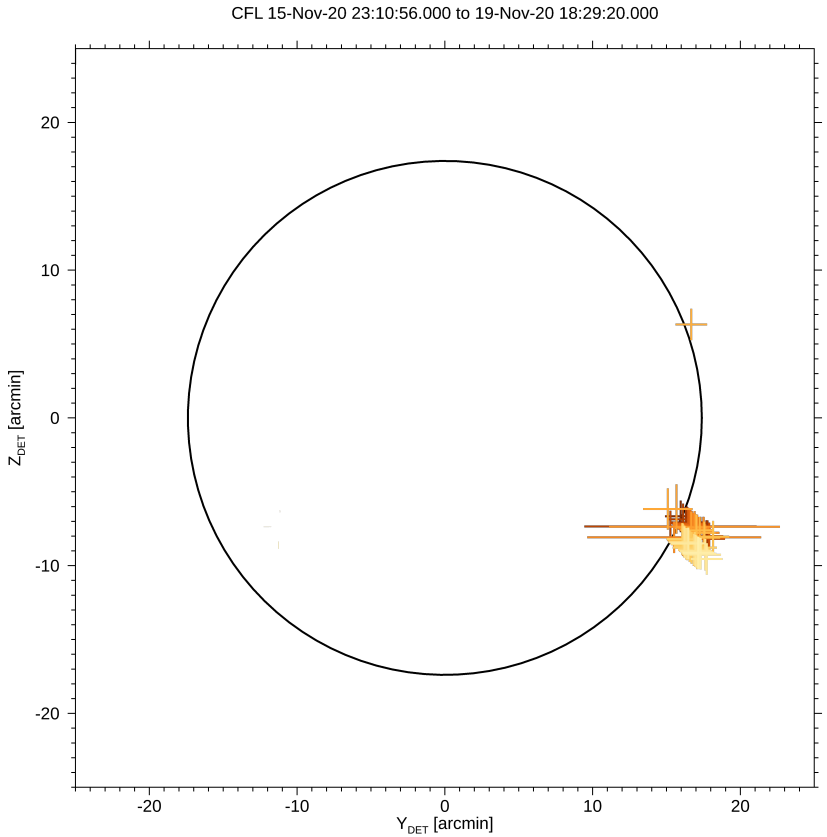


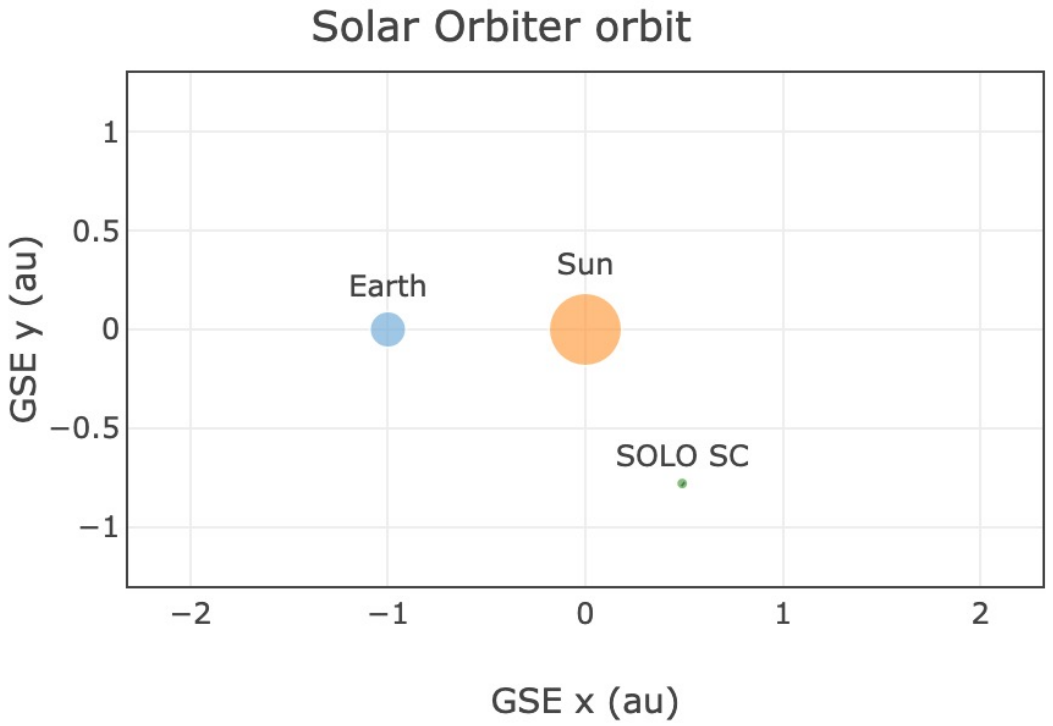


CFL Detector Counts

November 2020 Events

- Almost all emission from active region on SW limb
- Position of Solar Obiter means no Earth based context
- Orbiter-Earth separation ~ 122°
- Consistent with observations made with other SO instruments





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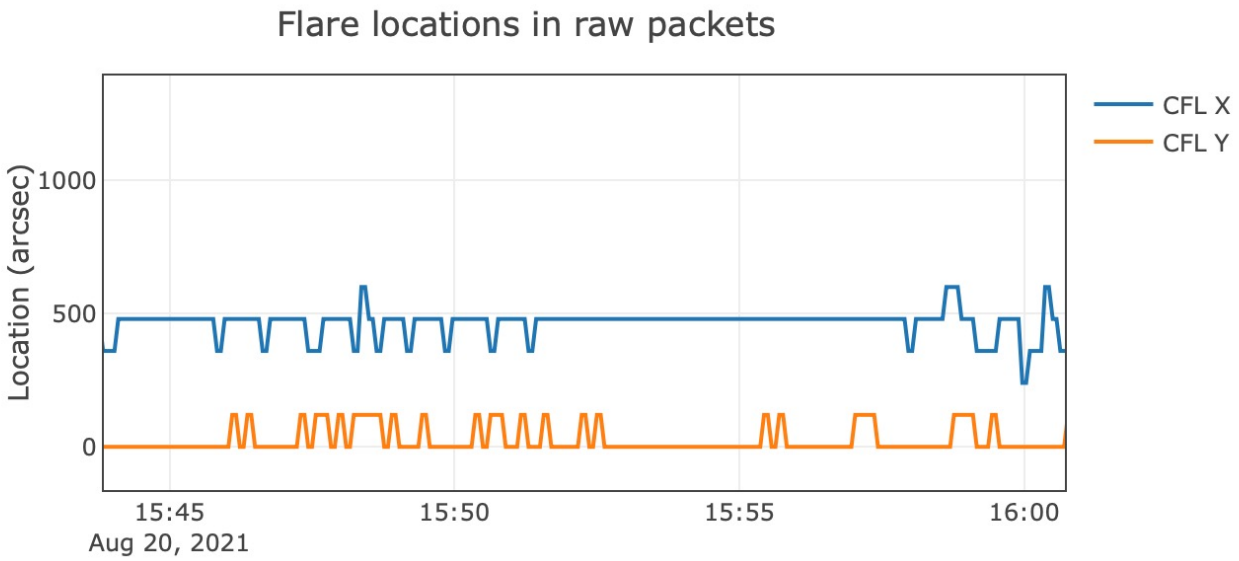
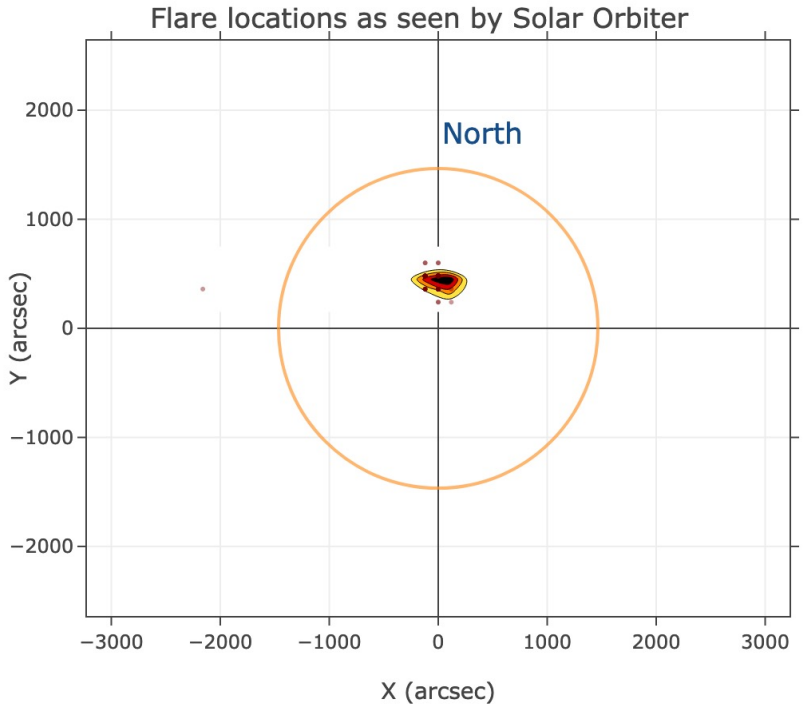
On Board Location Estimates

- STIX FSW makes estimates of the location on board
- Occurs on 8 second intervals when flare flag is active
- Location values are telemetered as quicklook data
- Gives rough estimate of location





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Conclusions

- Ground based calculations of coarse flare location agree with locations seen in other instruments
- This is consistent across multiple flares at different positions on the Sun
- For large flares on board determination is expected to work well

References

- Krucker, S et al. The Spectrometer/Telescope for Imaging X-rays (STIX). Astronomy and Astrophysics, v. 642, Oct. 2020. DOI: 10.1051/0004-6361/201937362. [STIX Instrument Paper]
- Battaliga, A. F. et al. STIX X-ray microflare observations during the Solar Orbiter commissioning phase Astronomy and Astrophysics special Issue (accepted) [STIX First Results Paper]