



HXR observations at flux rope anchor points

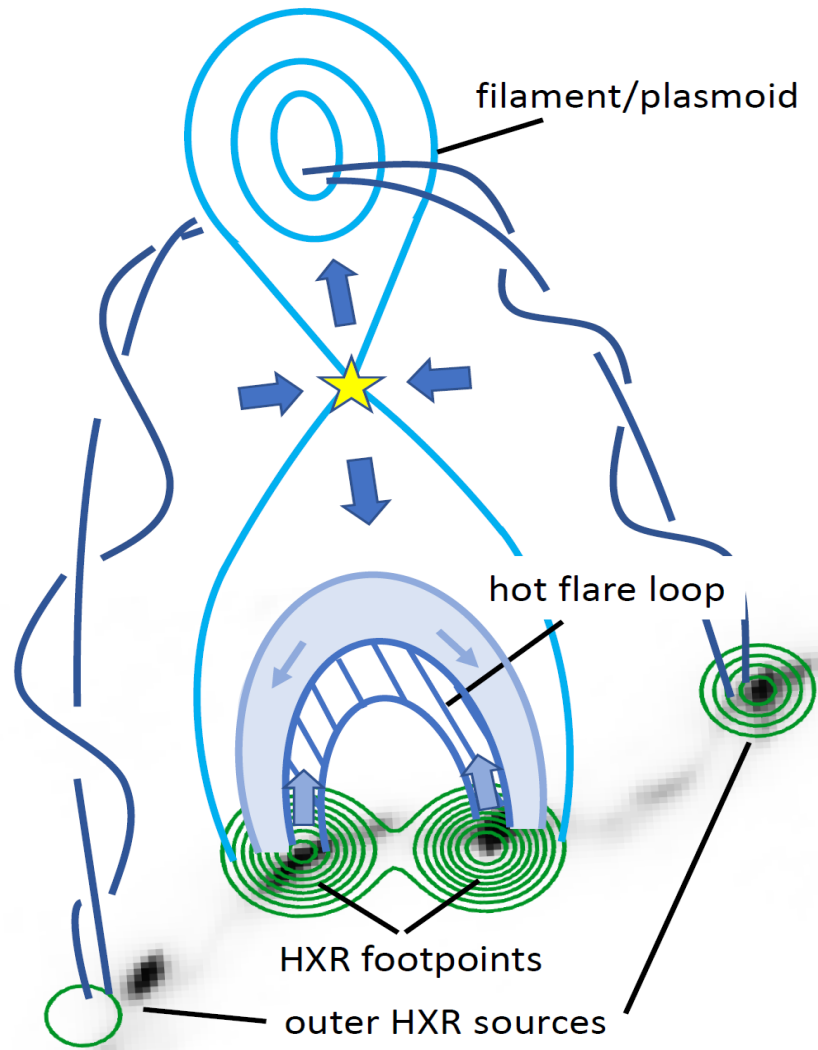
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Astrid Veronig³, Louise Harra^{1,4}, Säm Krucker¹

Results from Stiefel, Razquin et al. (2026), in prep.

1 FHNW, 2 ETHZ, 3 Uni Graz, 4 PMOD/WRC

Introduction: HXR at flux rope anchor points



Stiefel et al. (2023)

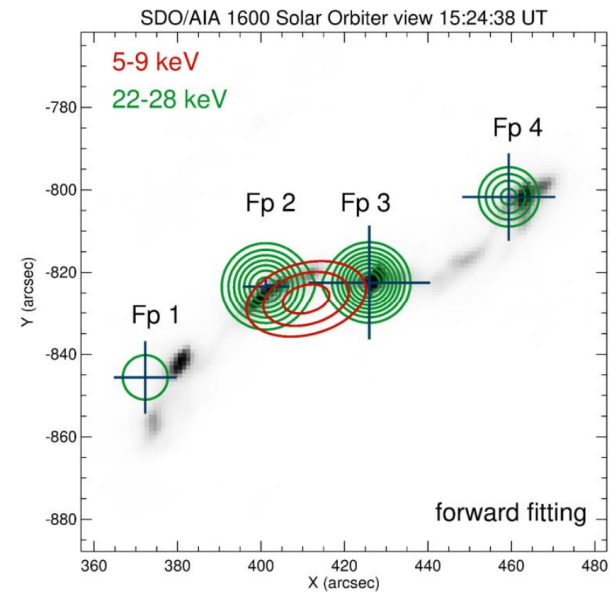


Figure: Stiefel et al. (2023)

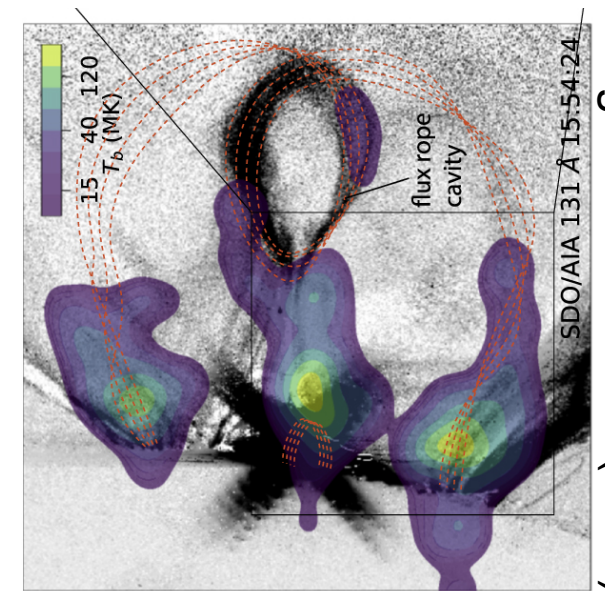
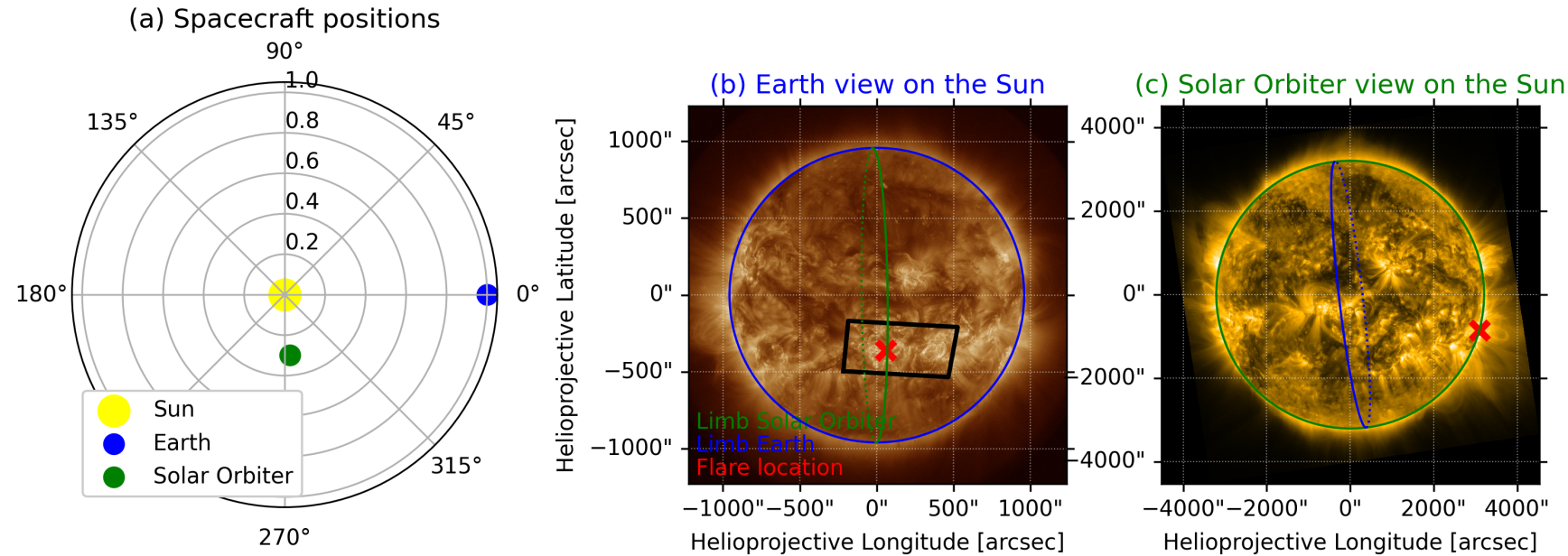
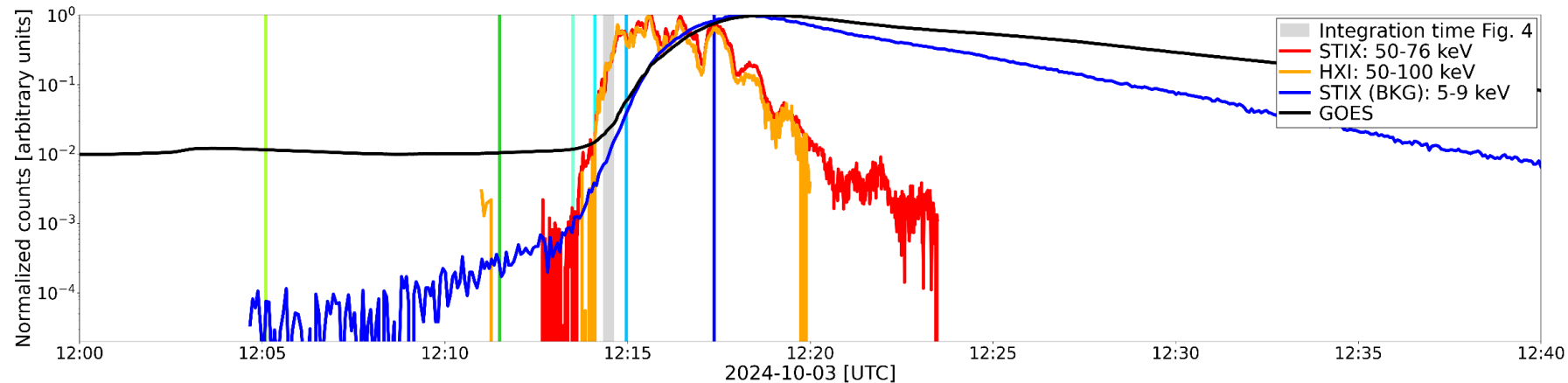


Figure: Chen et al. (2020)

X9 class flare on October 3rd 2024

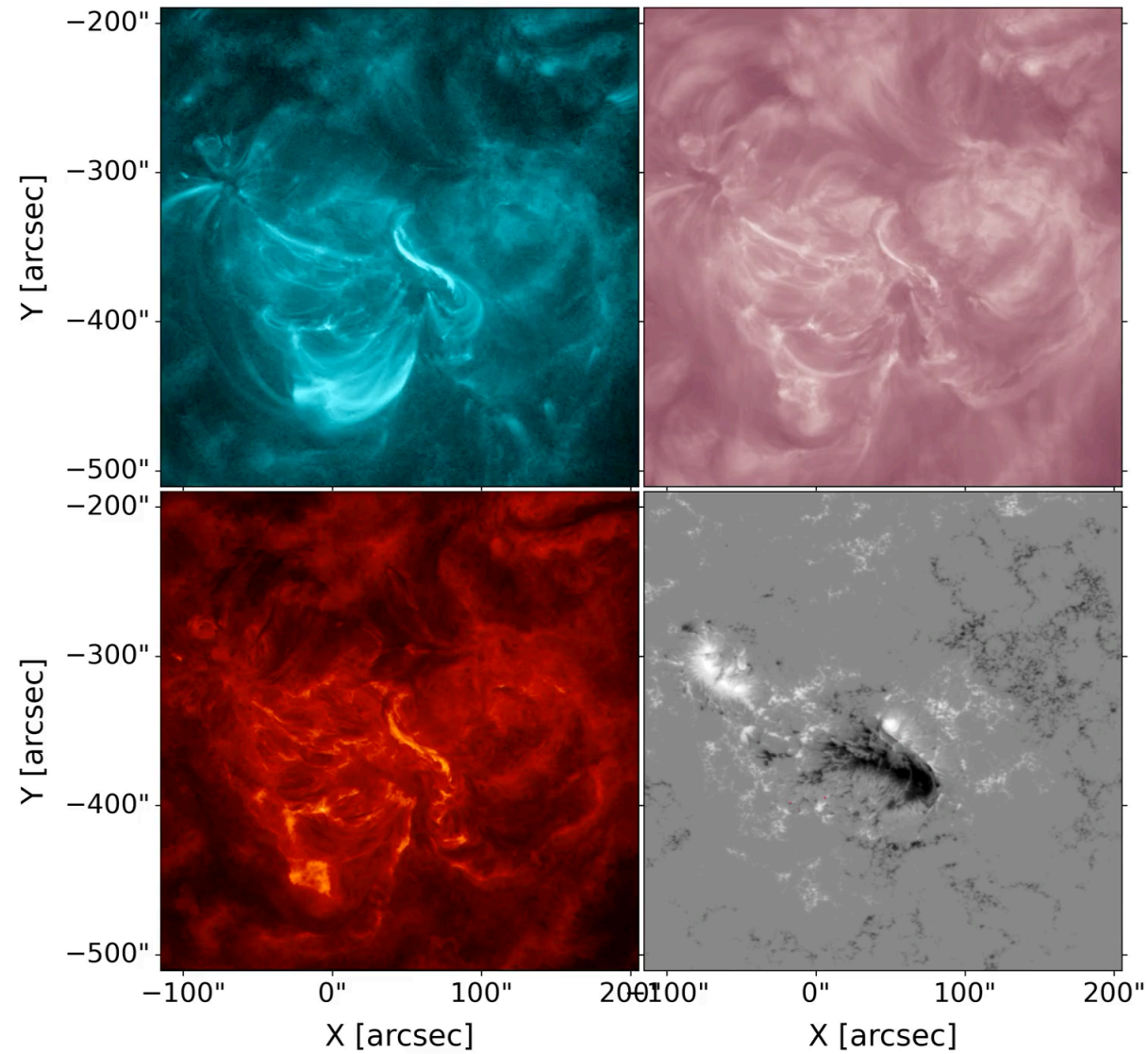


- X9-class flare
- On-disk: Earth view
- Solar Orbiter: at limb



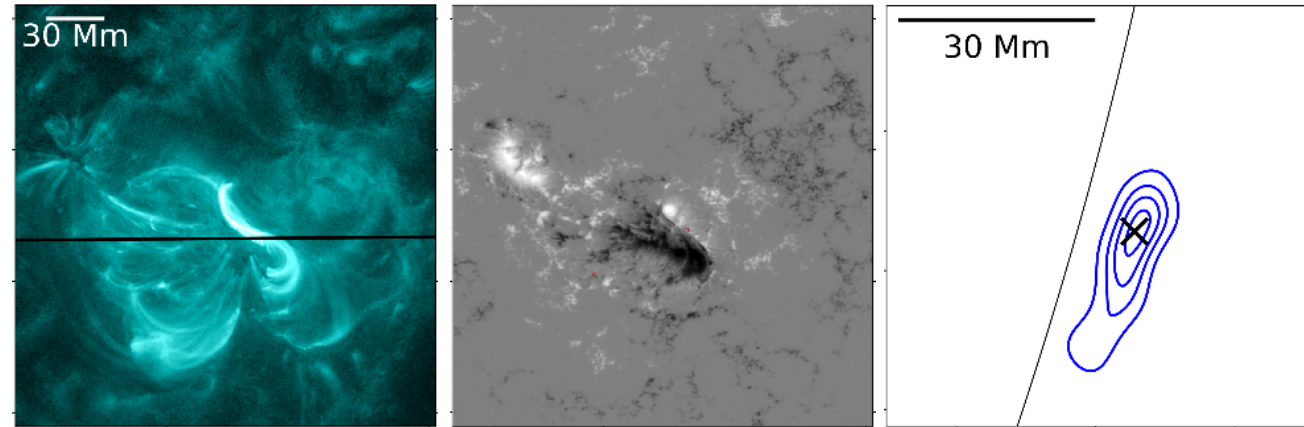
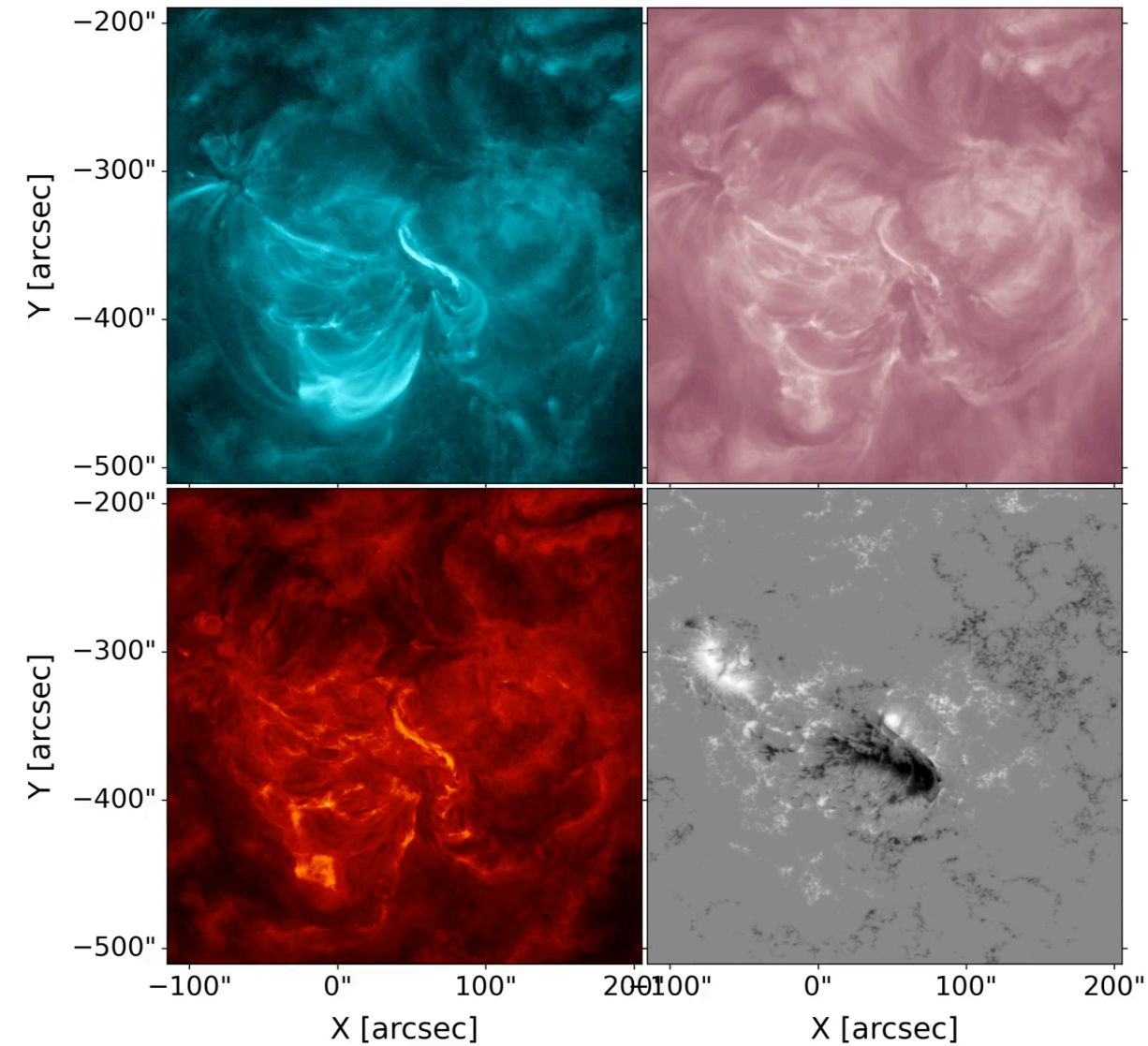
Temporal evolution

12:07:50 UT

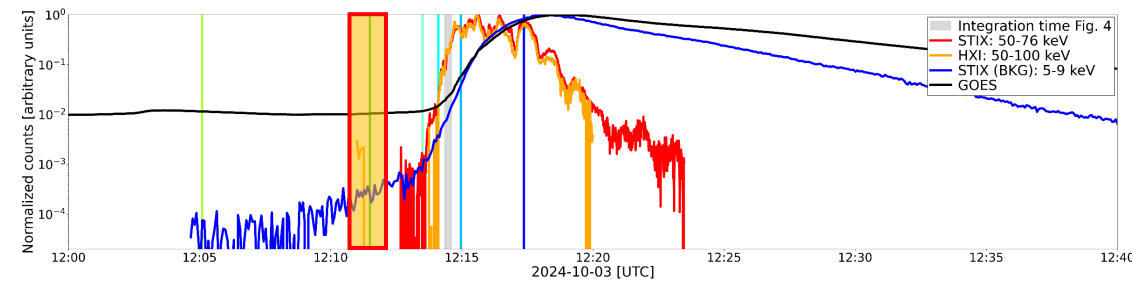


Temporal evolution

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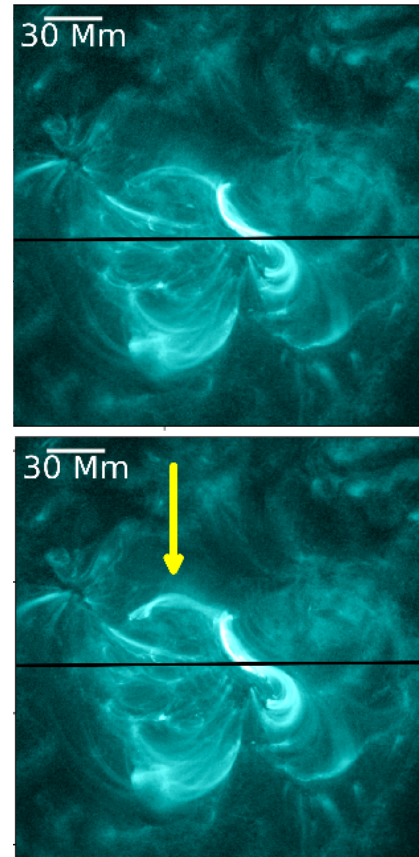
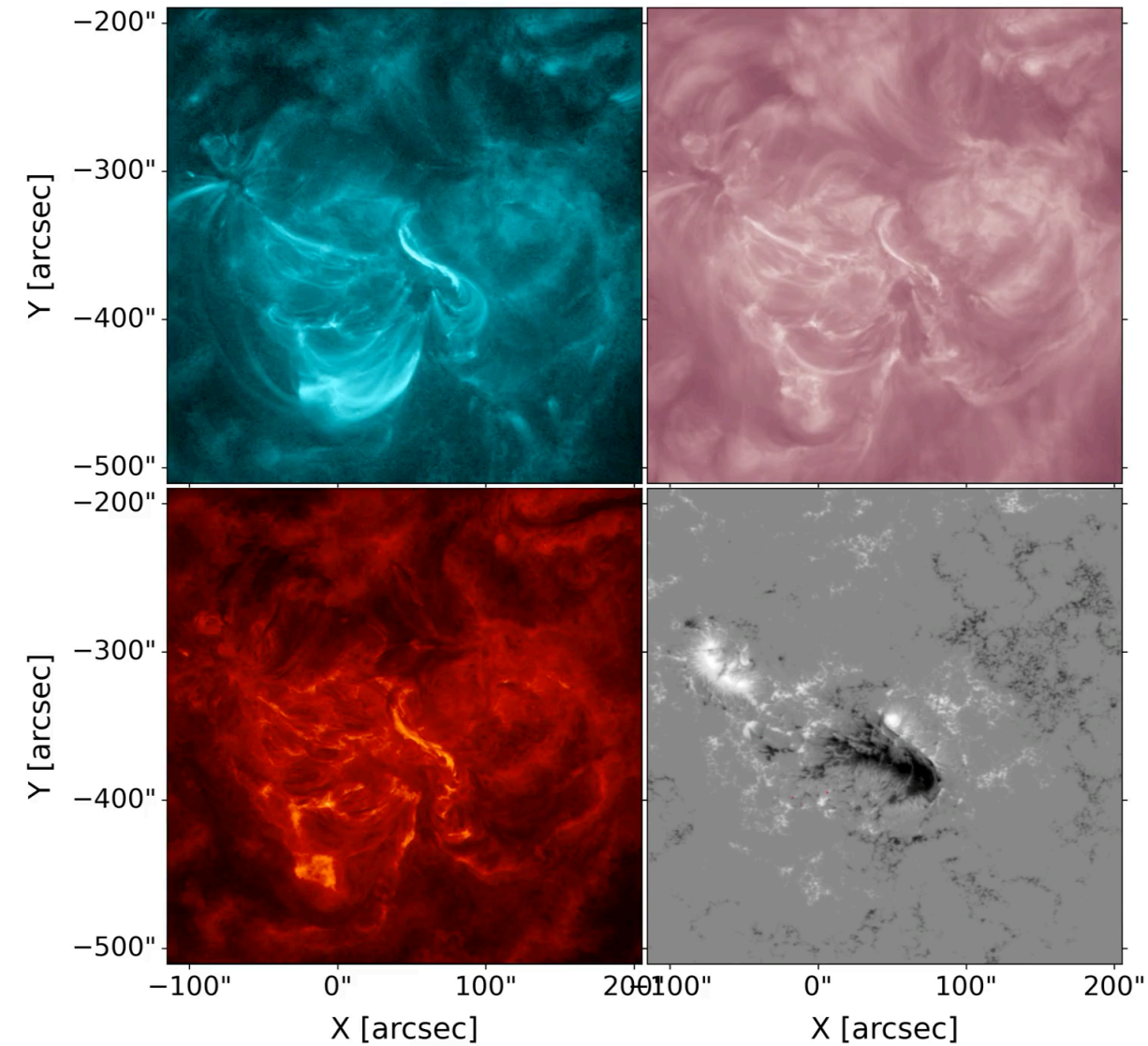


- Sigmoid structure brightening

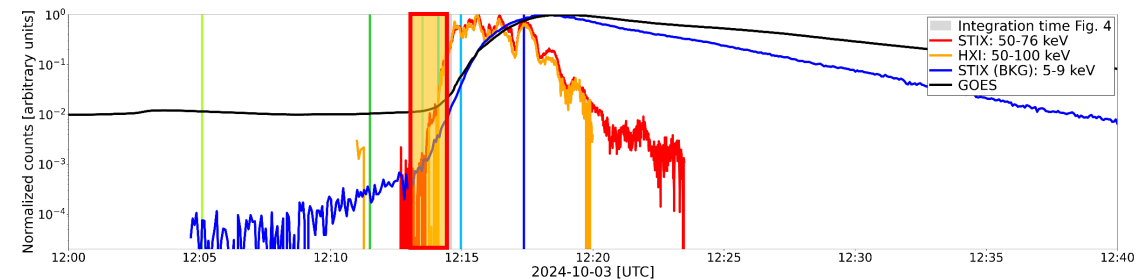


Temporal evolution

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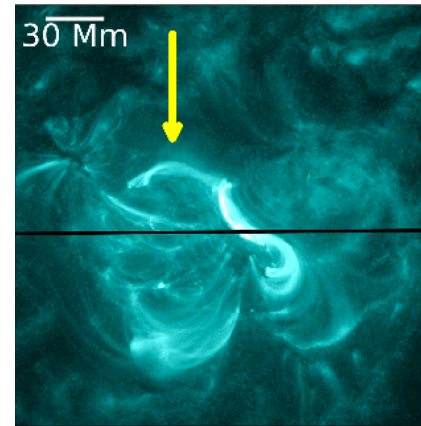
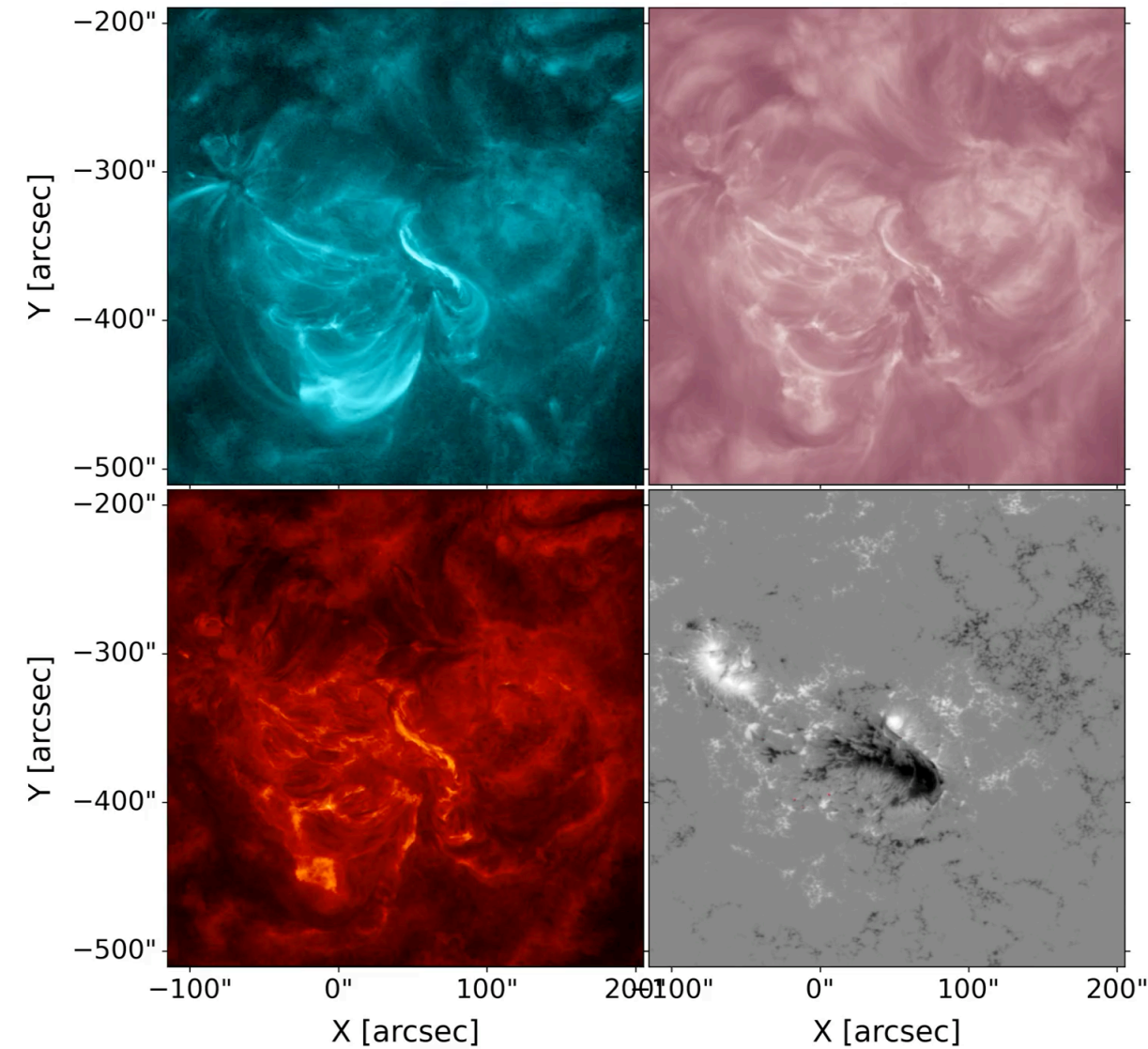


- Sigmoid structure brightening
- Extension to the north

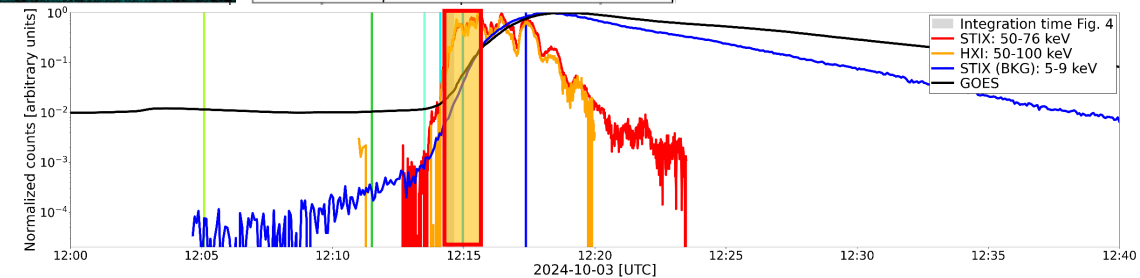
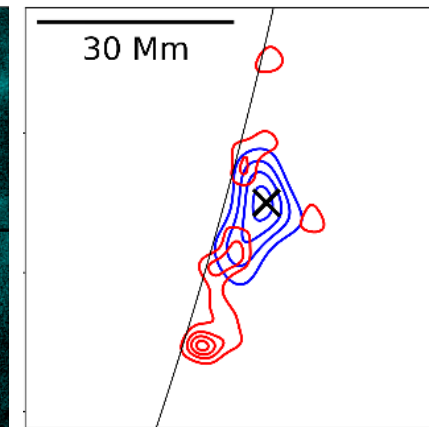
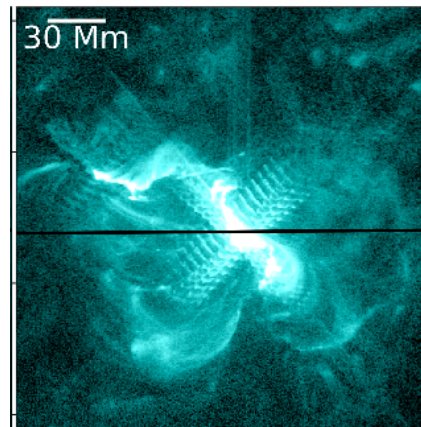


Temporal evolution

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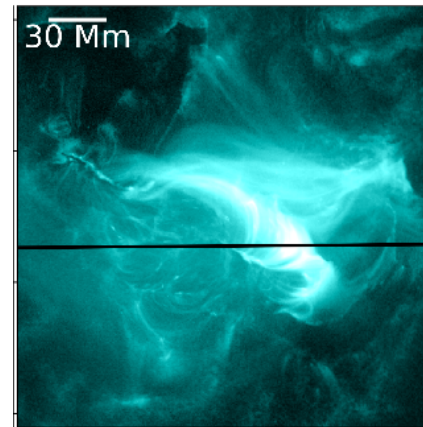
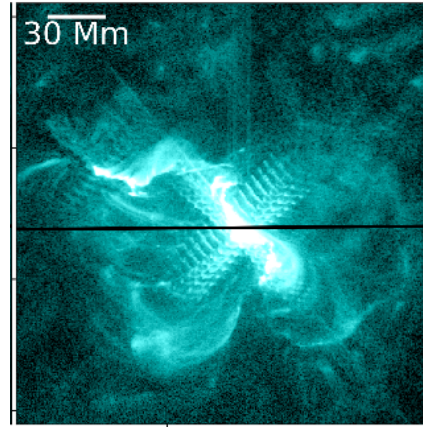
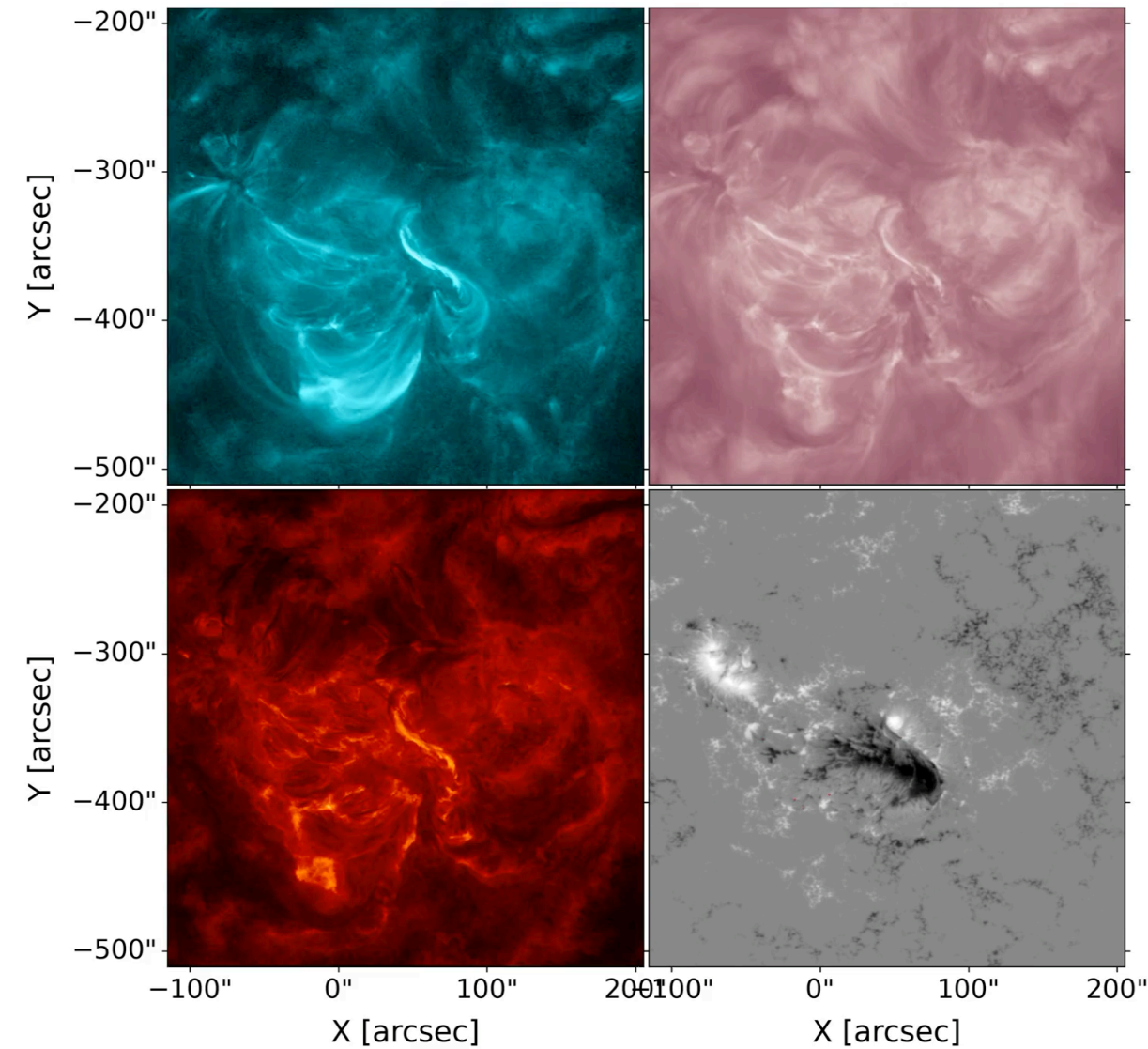


- Sigmoid structure brightening
- Extension to the north
- Eruption: Flare & CME

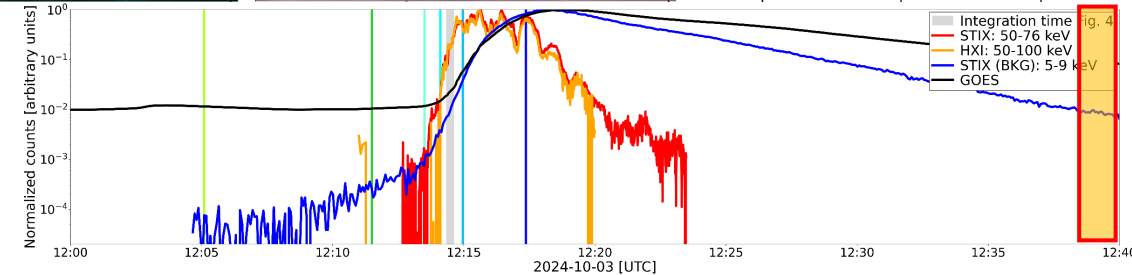
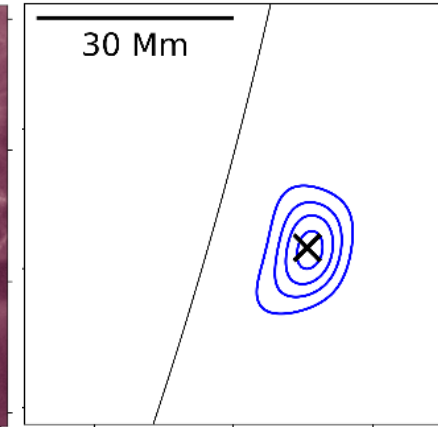
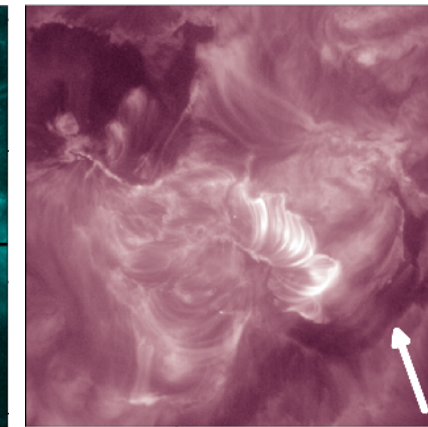


Temporal evolution

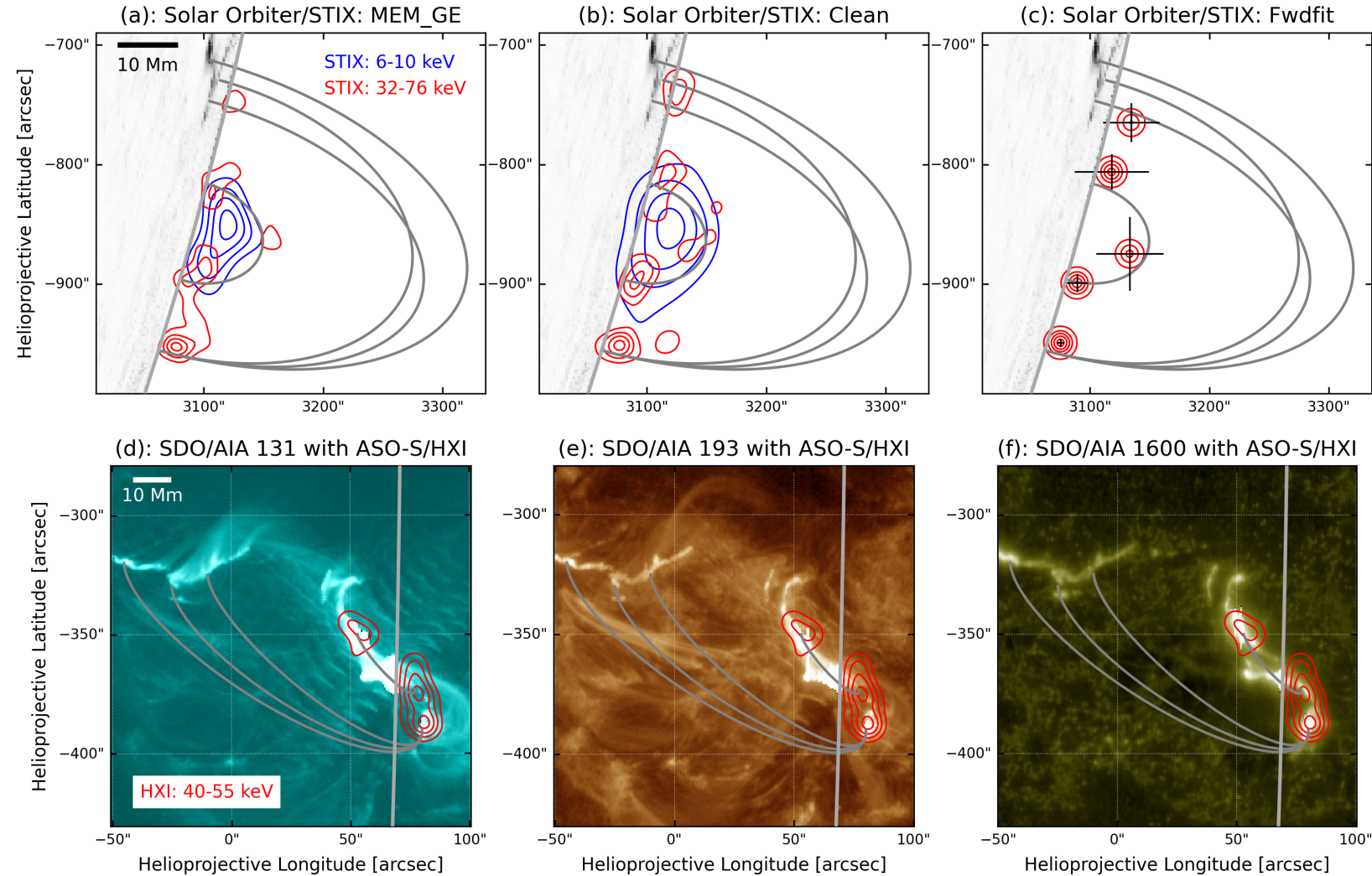
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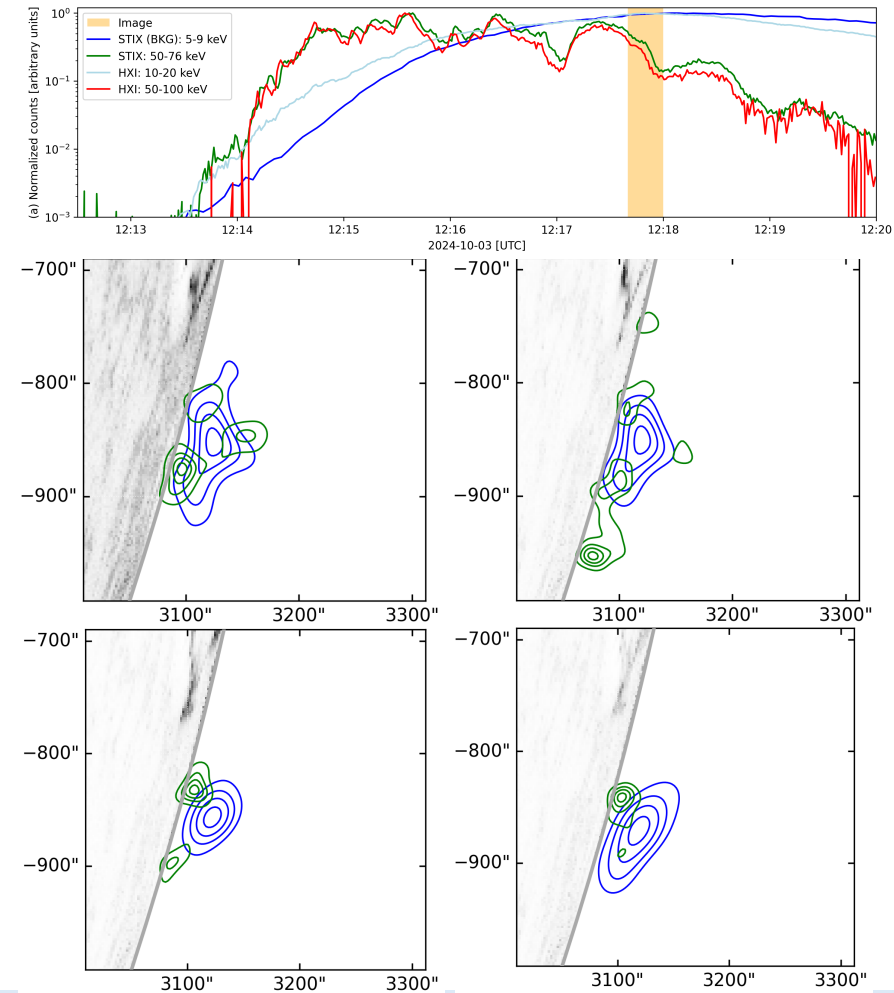
- Sigmoid structure brightening
- Extension to the north
- Eruption: Flare & CME
- Dimming regions



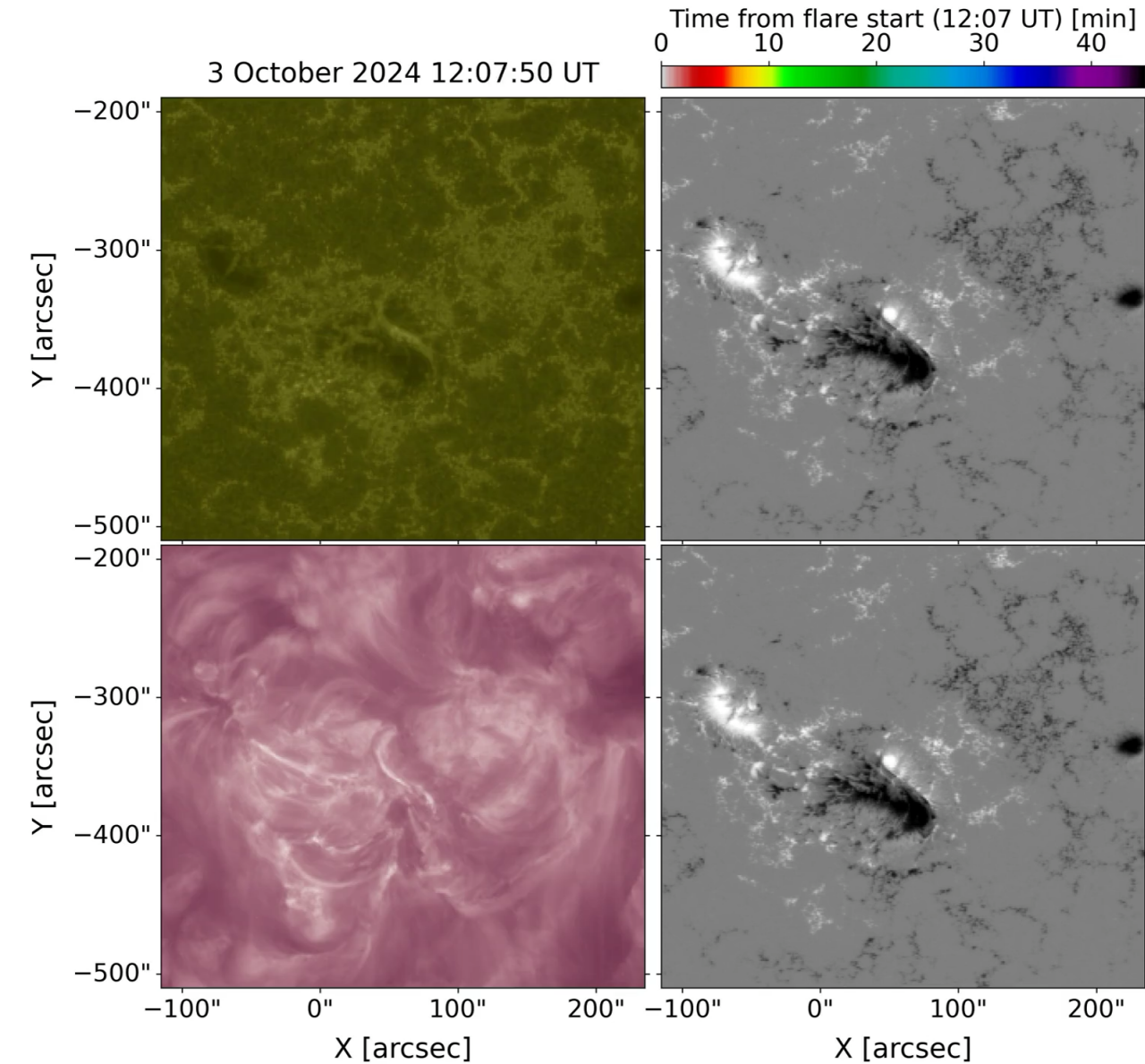
HXR observations



- Five sources with STIX
- Three sources with HXI



Flare ribbons - dimming regions - magnetic field extrapolation

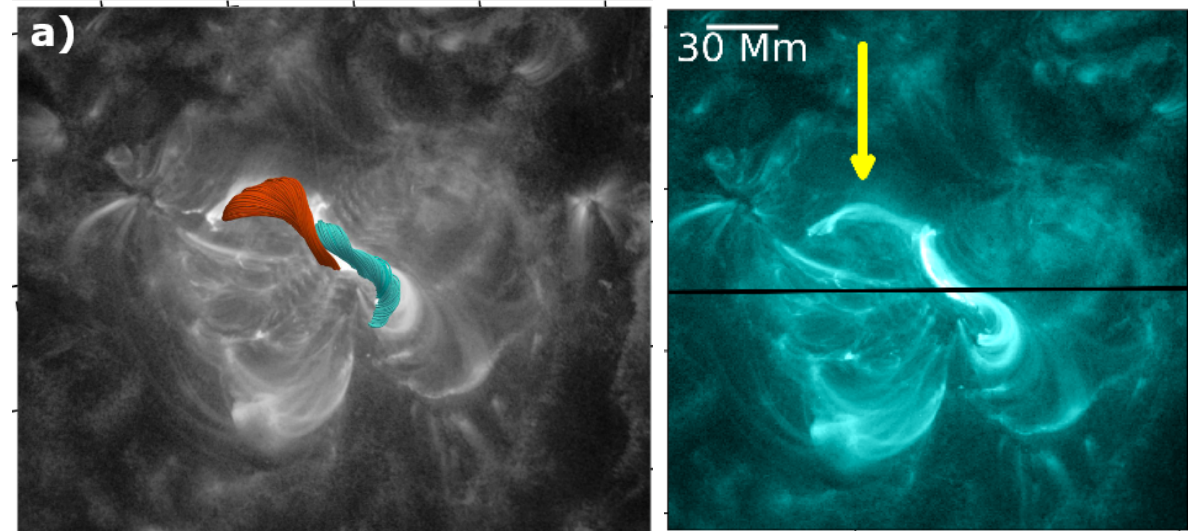


Color code: Timestamp of first detection

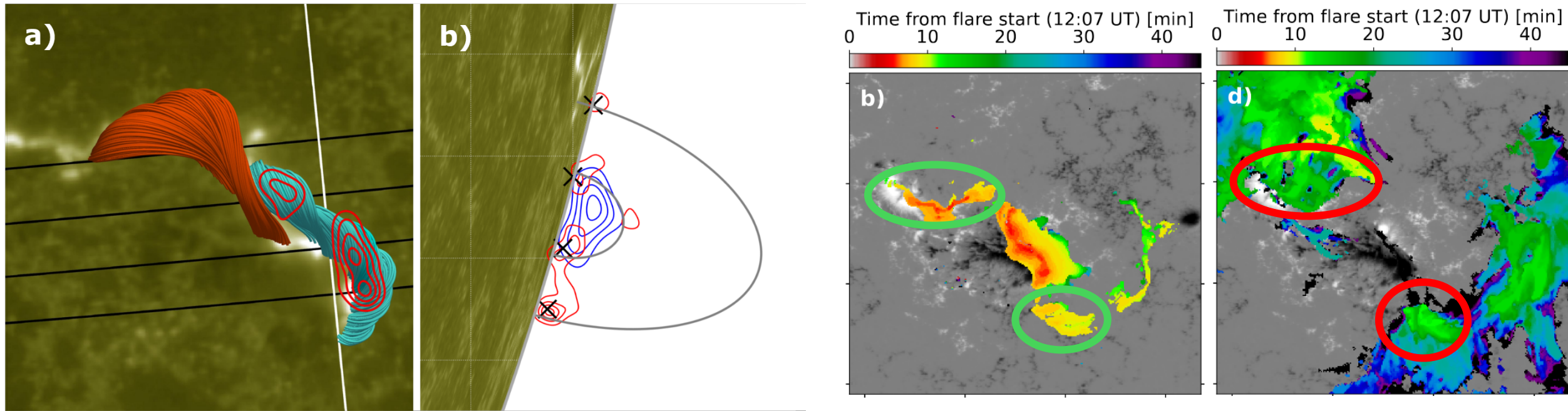
Top panels: Flare ribbon evolution

Bottom panels: Dimming regions evolution

Two pre-existing magnetic flux ropes

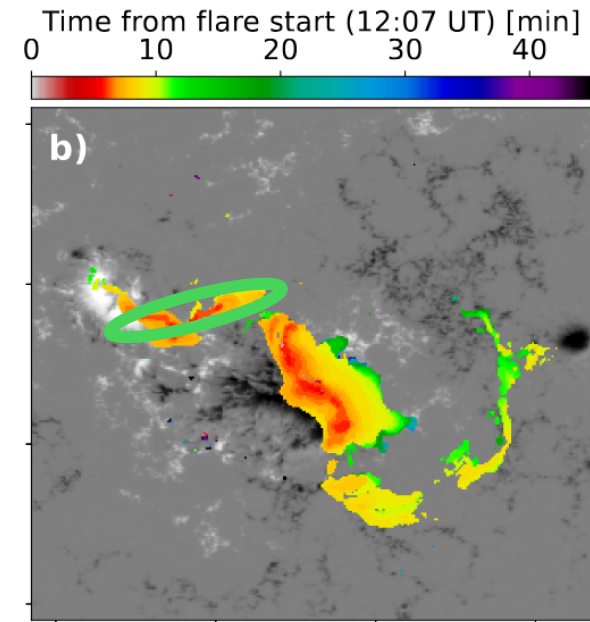
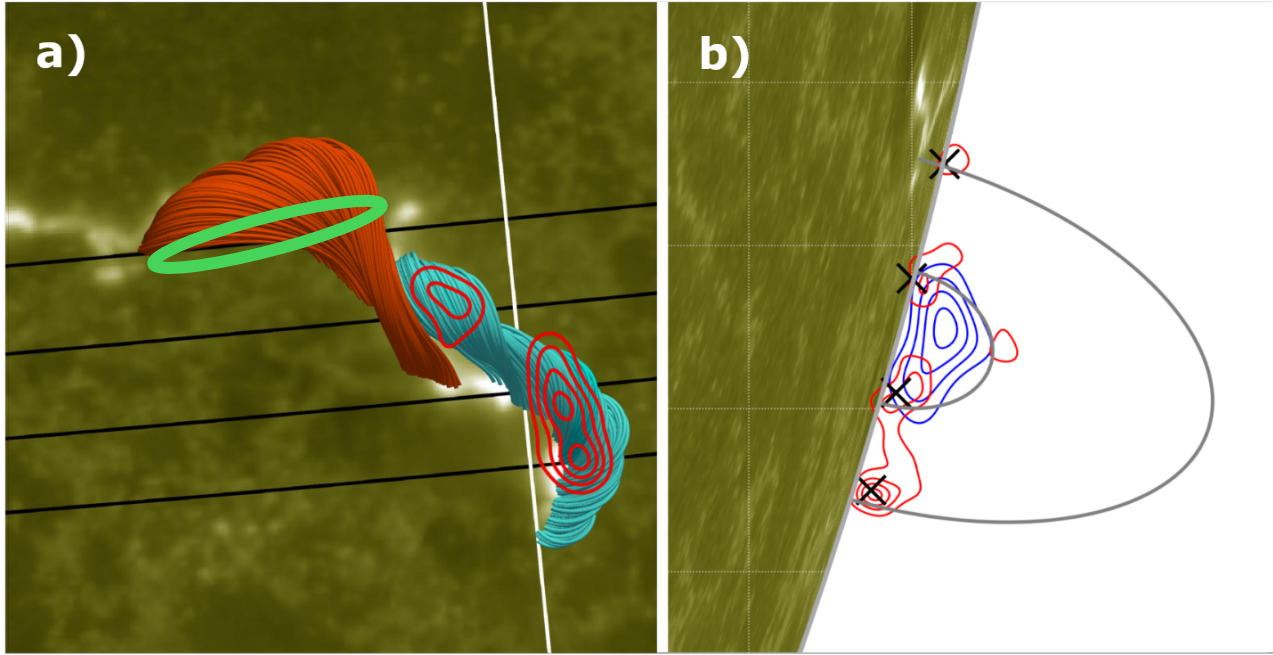


Tether-cutting reconnection: HXR at anchor points



- Two pre-existing magnetic structures: tether-cutting reconnection
- Large structure, anchored in outer sources -> eruption
- Region of dimming regions

Different viewing angles can make a difference



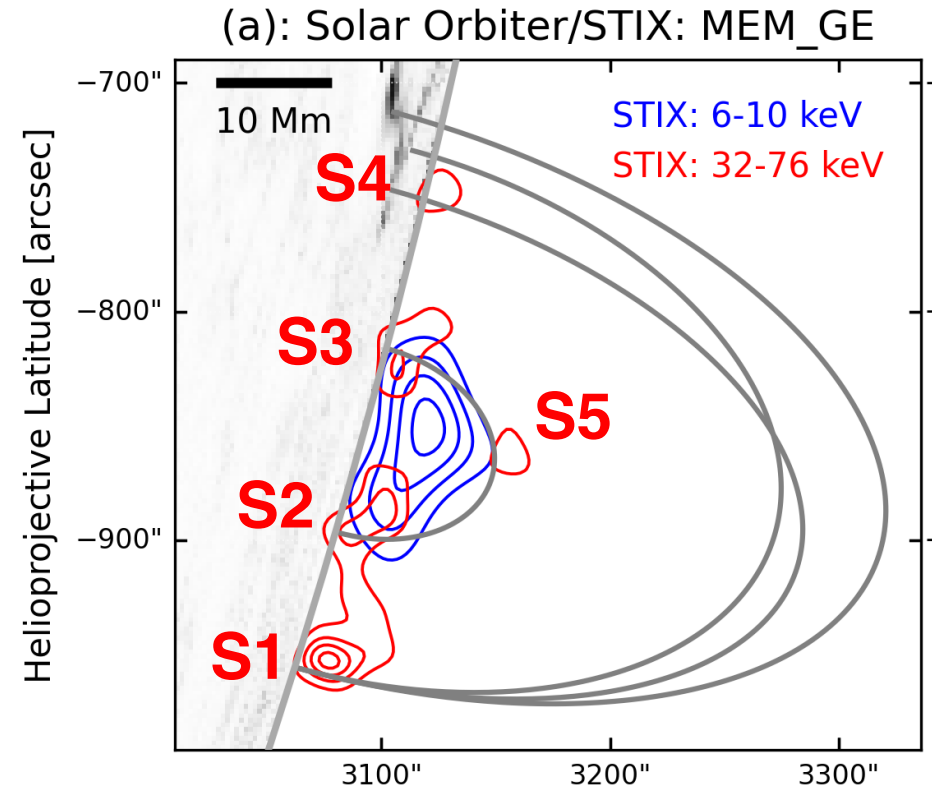
Why do we not see the norther source with HXI?

- Projection effect?
- Large region from Earth view -> indirect imaging no sensitivity
- Smaller region from Solar Orbiter view

Discussion multiple sources with STIX

Are these 5 sources real in STIX?

- 50'000 counts for image reconstruction
- MEM_GE, clean, fwdfit give consistent results
- S2 & S3 consistent over flare (STIX & HXI)
- Strong S5 in step before
- S1 strongest source in this time step & HXI
- S4 most uncertain: context analysis
- Open: analyze visibilities to see if real signal?



! Multi-wavelength/instrument/viewing angle analysis helps to understand sources !

Summary

Multi-wavelength & vantage point analysis of impulsive phase of X9 flare

Magnetic field extrapolations & dimming region analysis support HXR's

HXR emission at flux rope anchor points



Questions?
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