Small-Scale Filament Eruptions Leading to Solar X-Ray Jets

Alphonse C. Sterling, Ronald L. Moore,
David A. Falconer, & Mitzi Adams

(Supported by NASA's LWS program, and thanks to ISSI/Bern)

Introduction: Solar X-Ray Jets

- Observed since the Yohkoh days (Shibata et al. 1992; also Shimojo et al. 1996, etc.)
- Yohkoh (SXT) saw them mainly in active regions.
- Hinode/XRT found them to be plentiful in polar coronal holes (Cirtain et al. 2007; also Savcheva et al. 2007, etc.)
- In polar coronal holes: size~50,000 km x 8000 km; rate ~60/day (Savcheva et al. 2007).
- Often have a "hot loop" at the jet's base.
- Often-discussed mechanism is based on emerging flux ("emerging-flux model"). (Shibata et al. 1992; see also Moore et al. 2010.)
- Many of the above ideas deduced from SXRs, and pre-SDO AIA observations.

Here we present observations of X-ray jets using high-resolution, high-cadence AIA observations, and discuss implications for the suggested emerging-flux mechanism.

A. Sterling, Apr 2015
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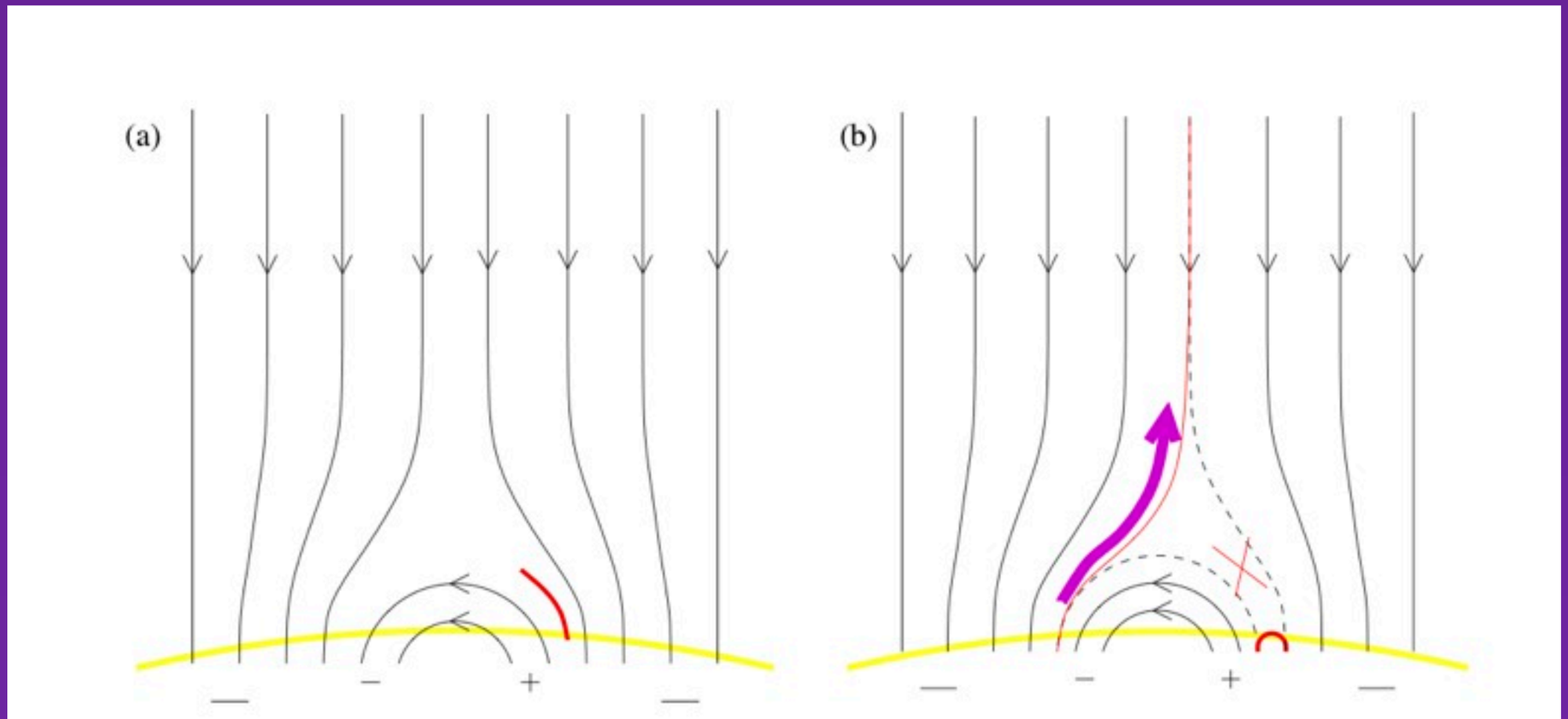
Emerging-Flux Model for (X-Ray) Jets



Supported by numerical simulations: Yokoyama & Shibata (1995), Nishizuka et al. (2008), Archontis et al. (2013), Moreno-Insertis et al. (2013), Fang et al. (2014), etc.

With this in mind, look at AIA data

- Studied 20 Hinode/XRT X-ray jets polar coronal holes during SDO period.

- These jets were randomly selected during a previous investigation (Moore et al. 2013).

- For first several jets, examined all seven SDO/AIA EUV channels.

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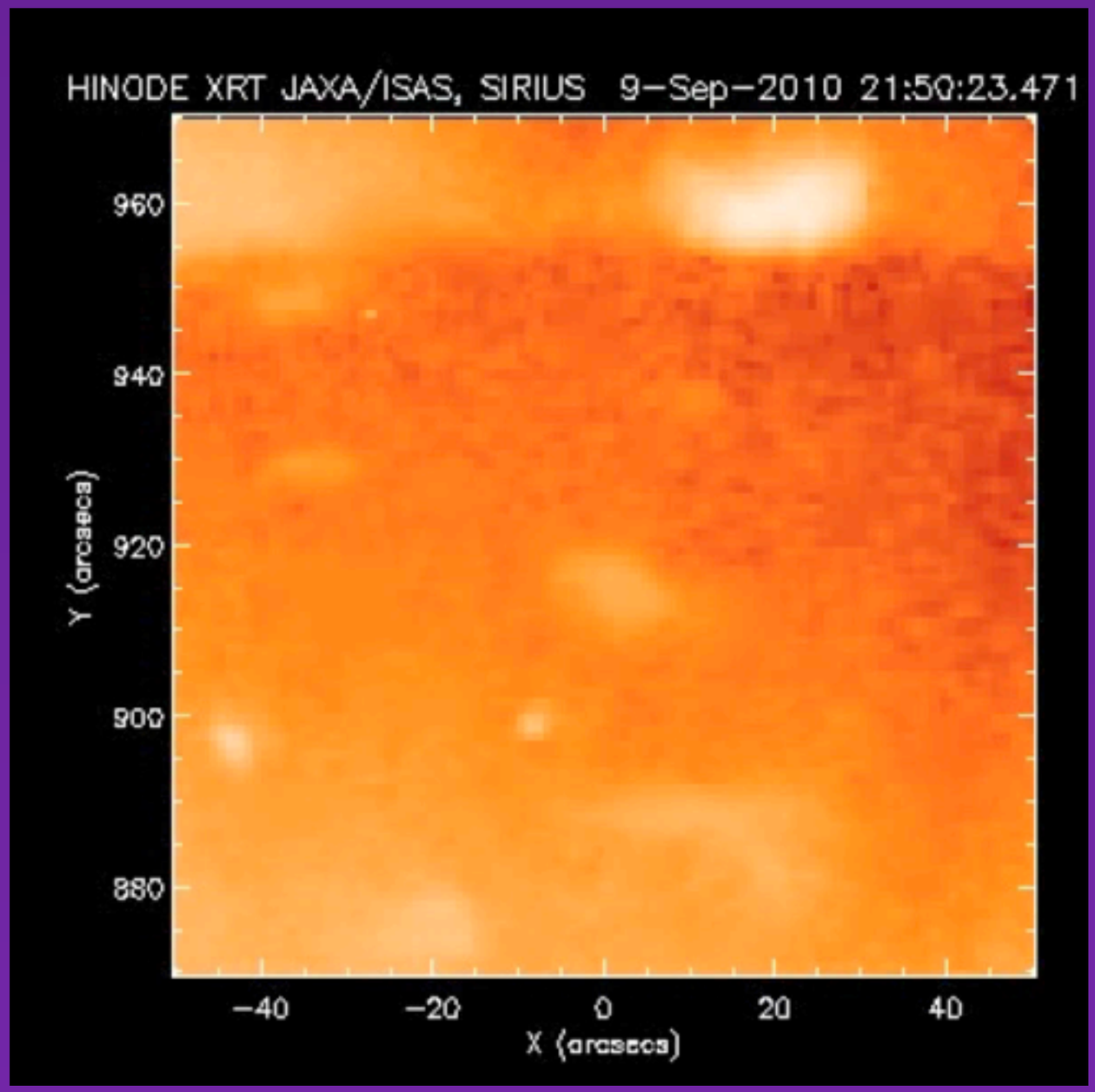
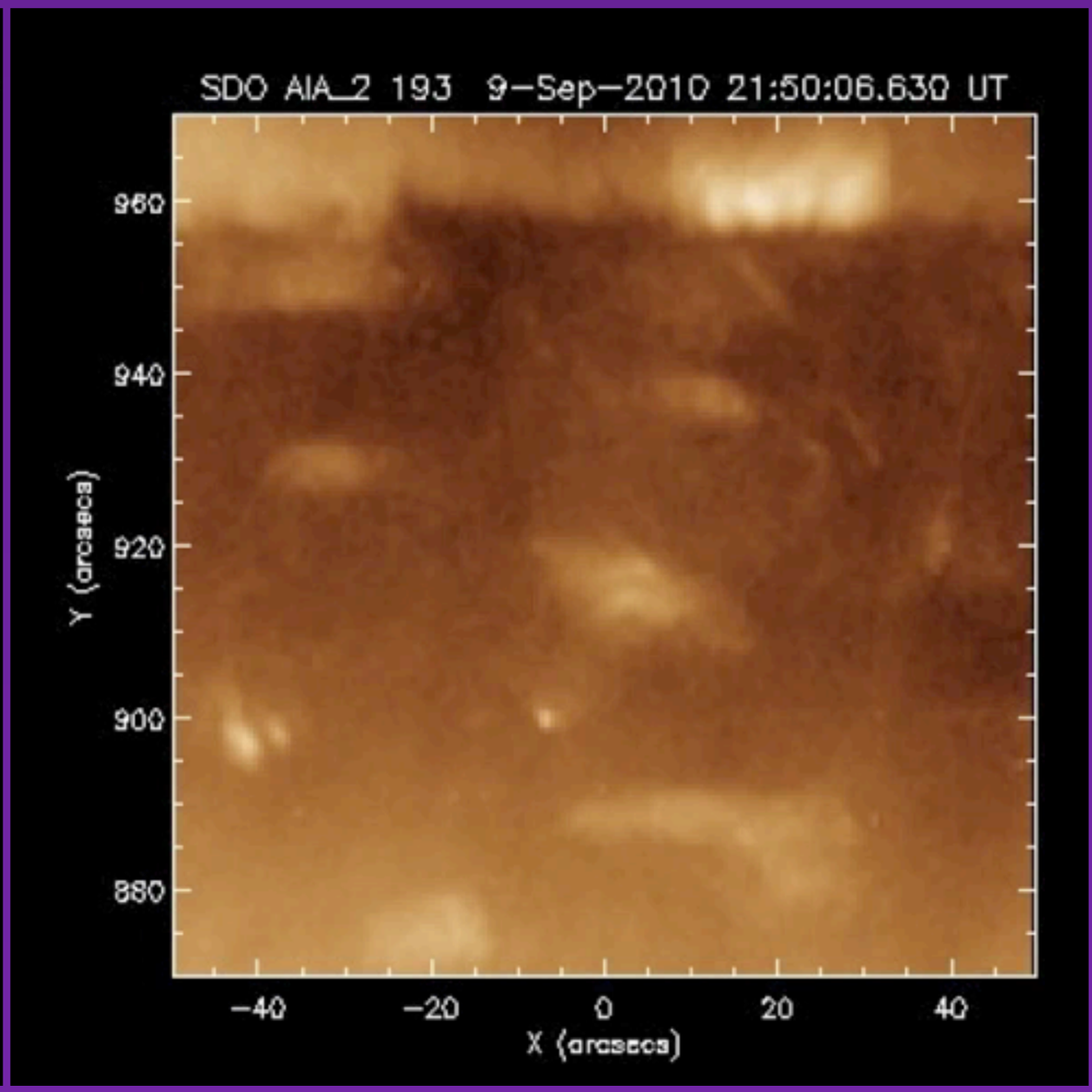
XRT

AIA 193

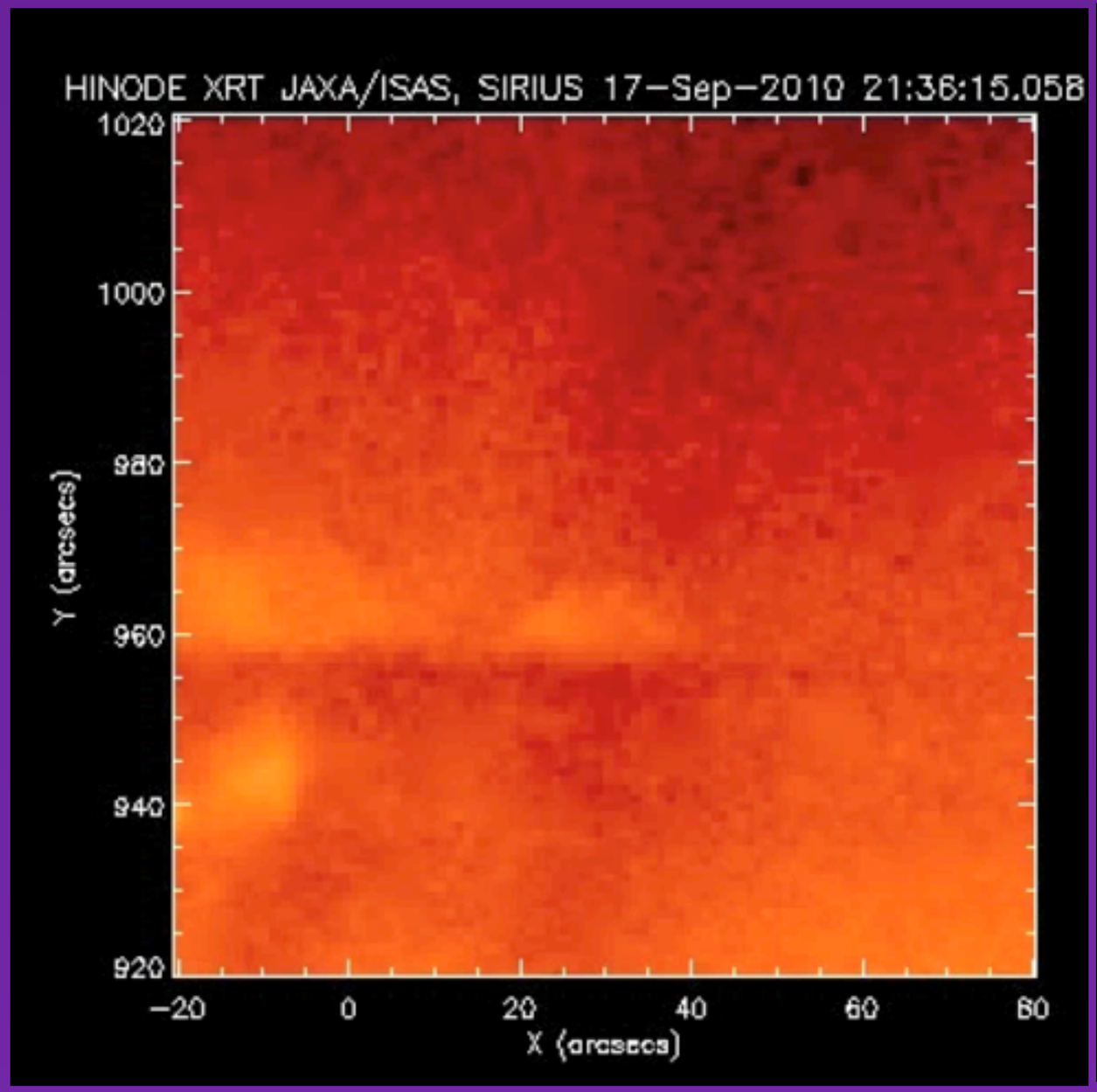


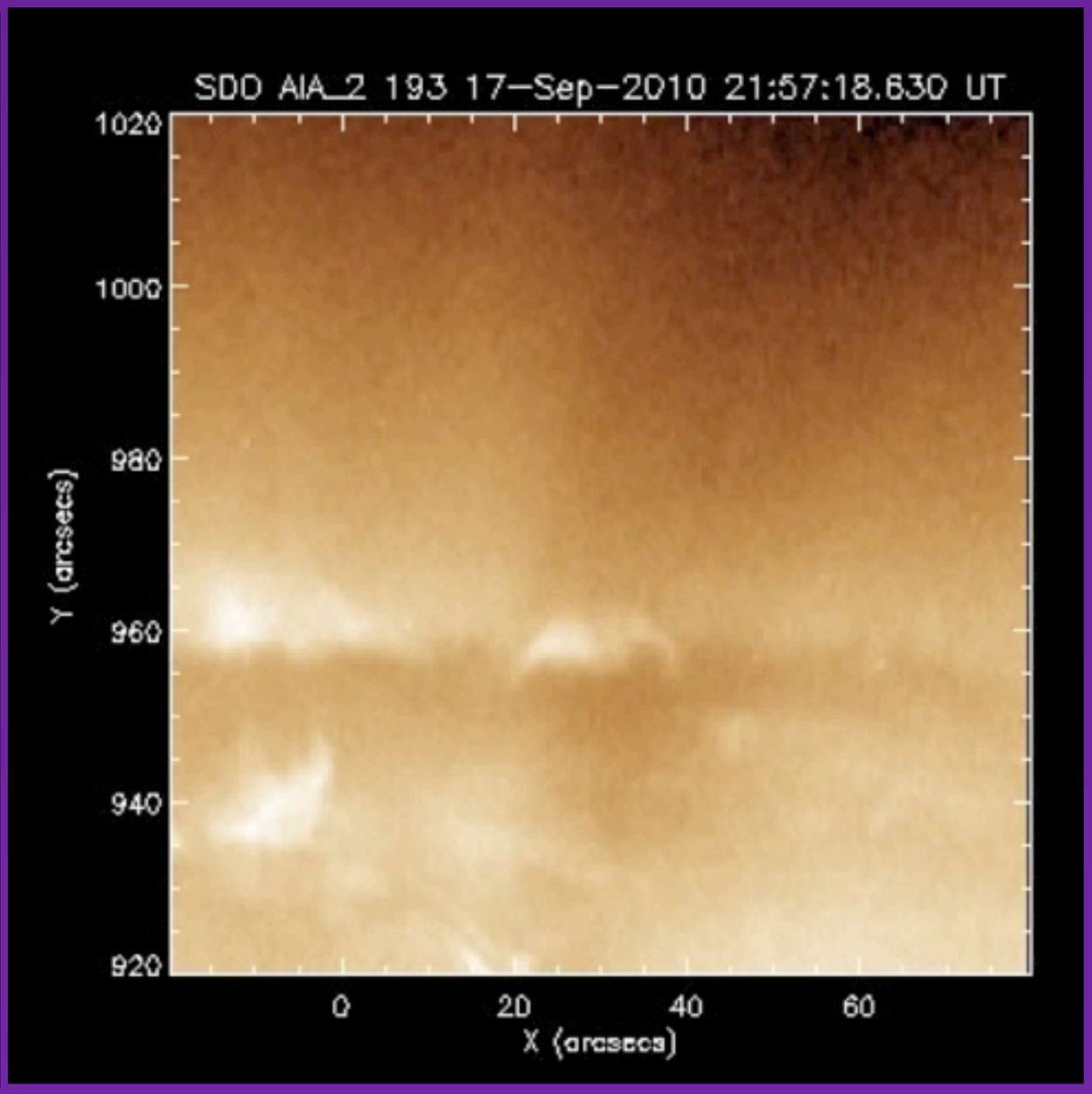


Event 12

XRT

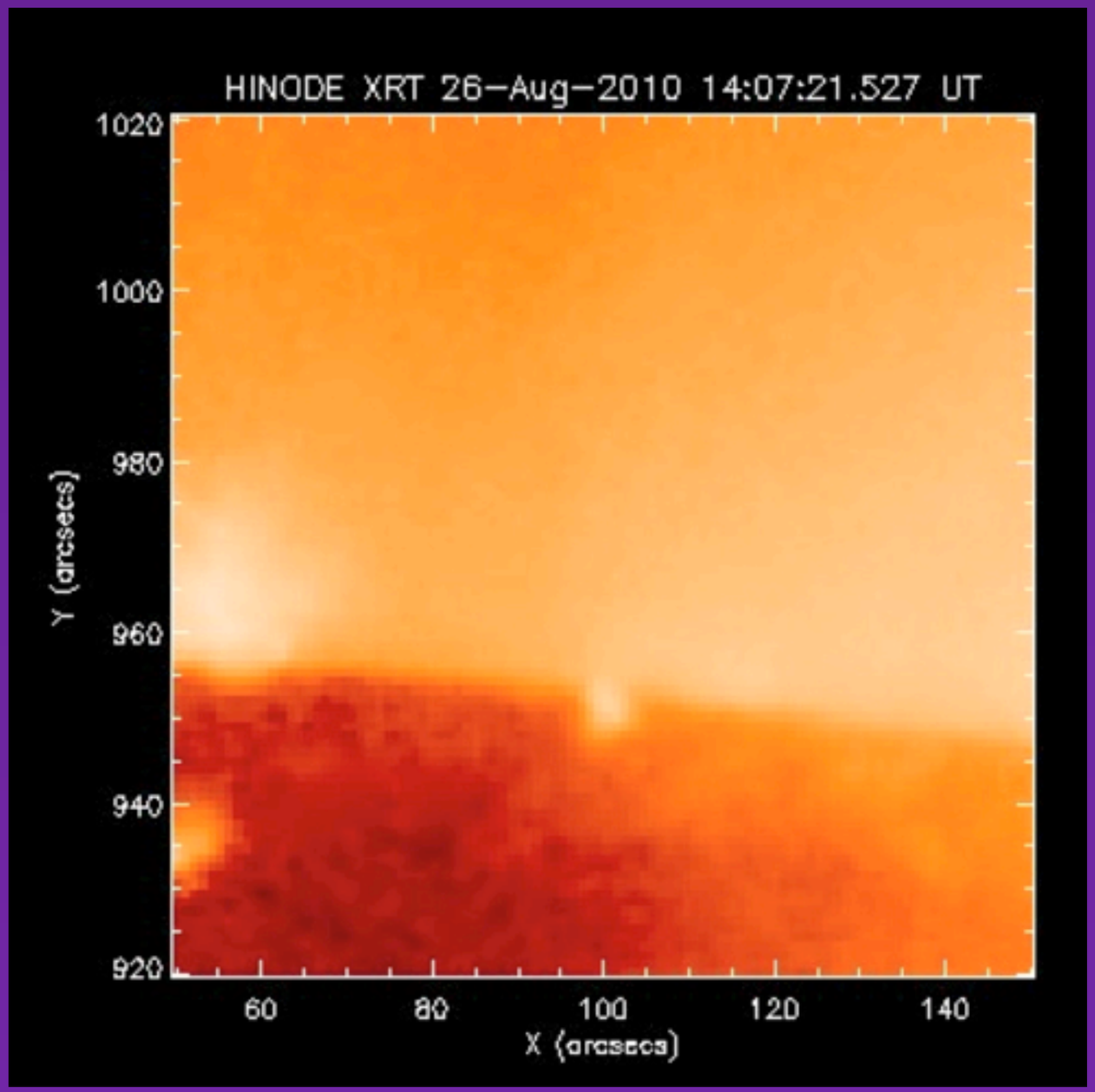
AIA 193



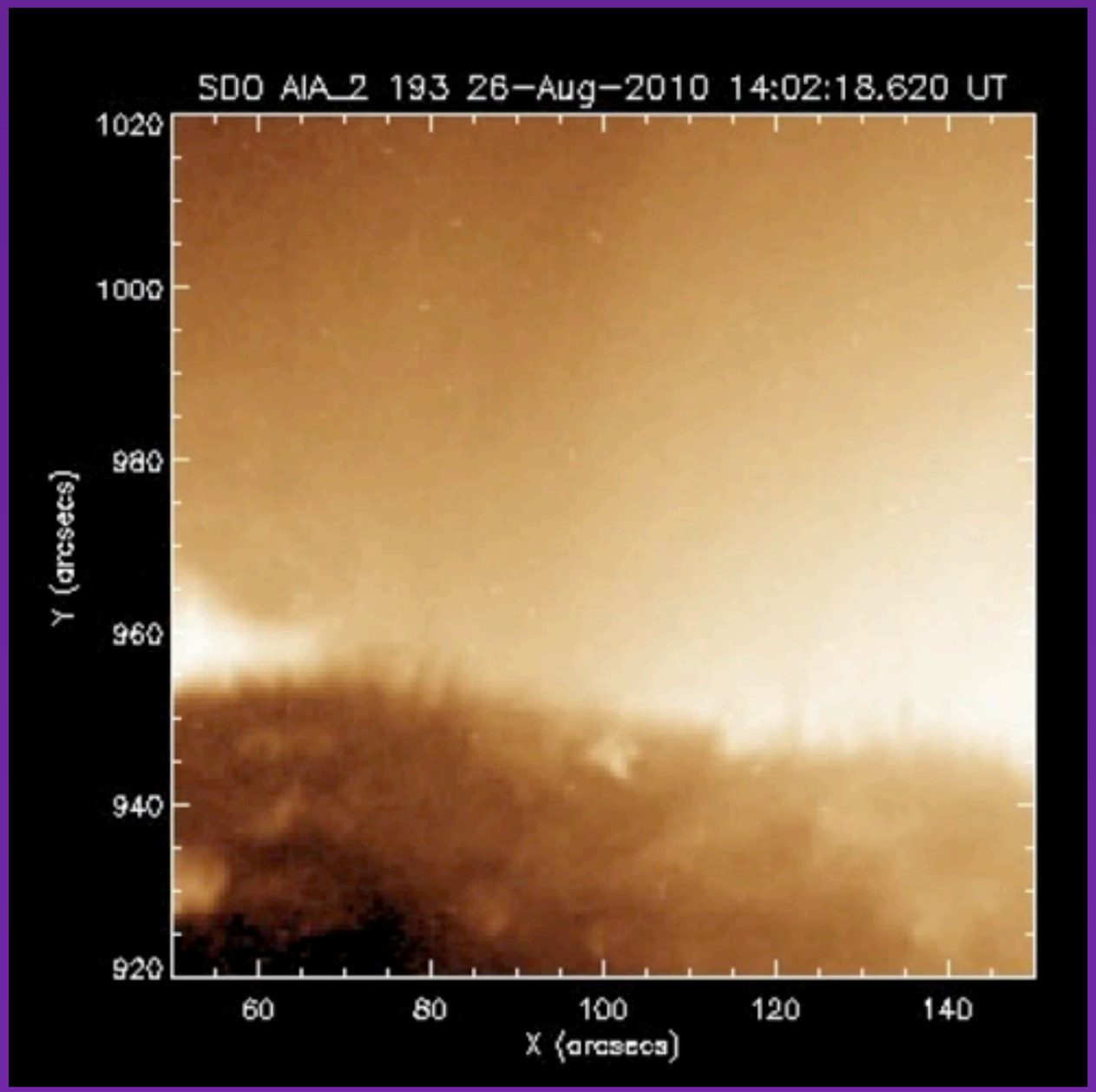


Event 18

XRT

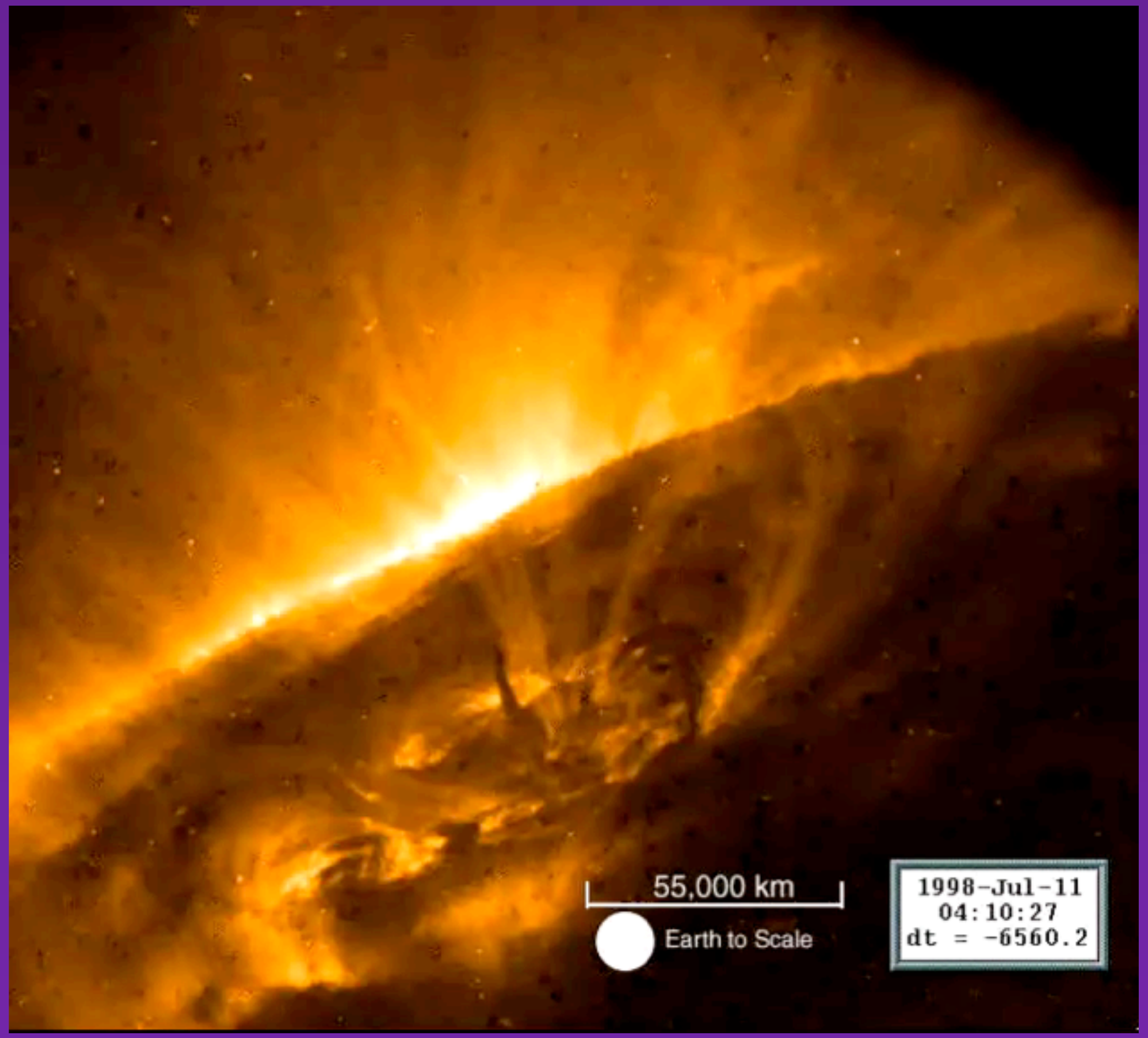


AIA 193



Event 3

“Normal” Filament Eruption (TRACE)



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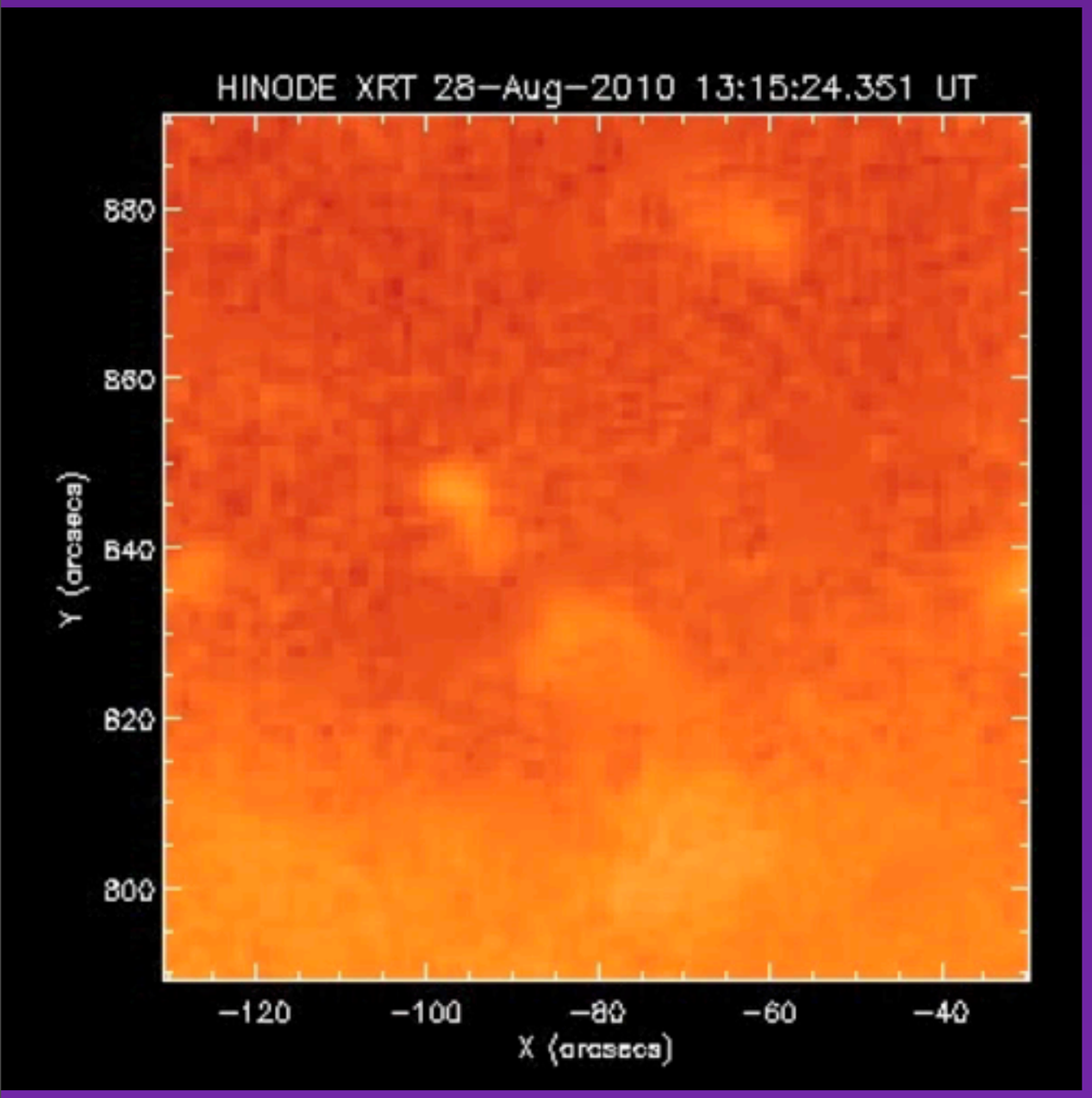
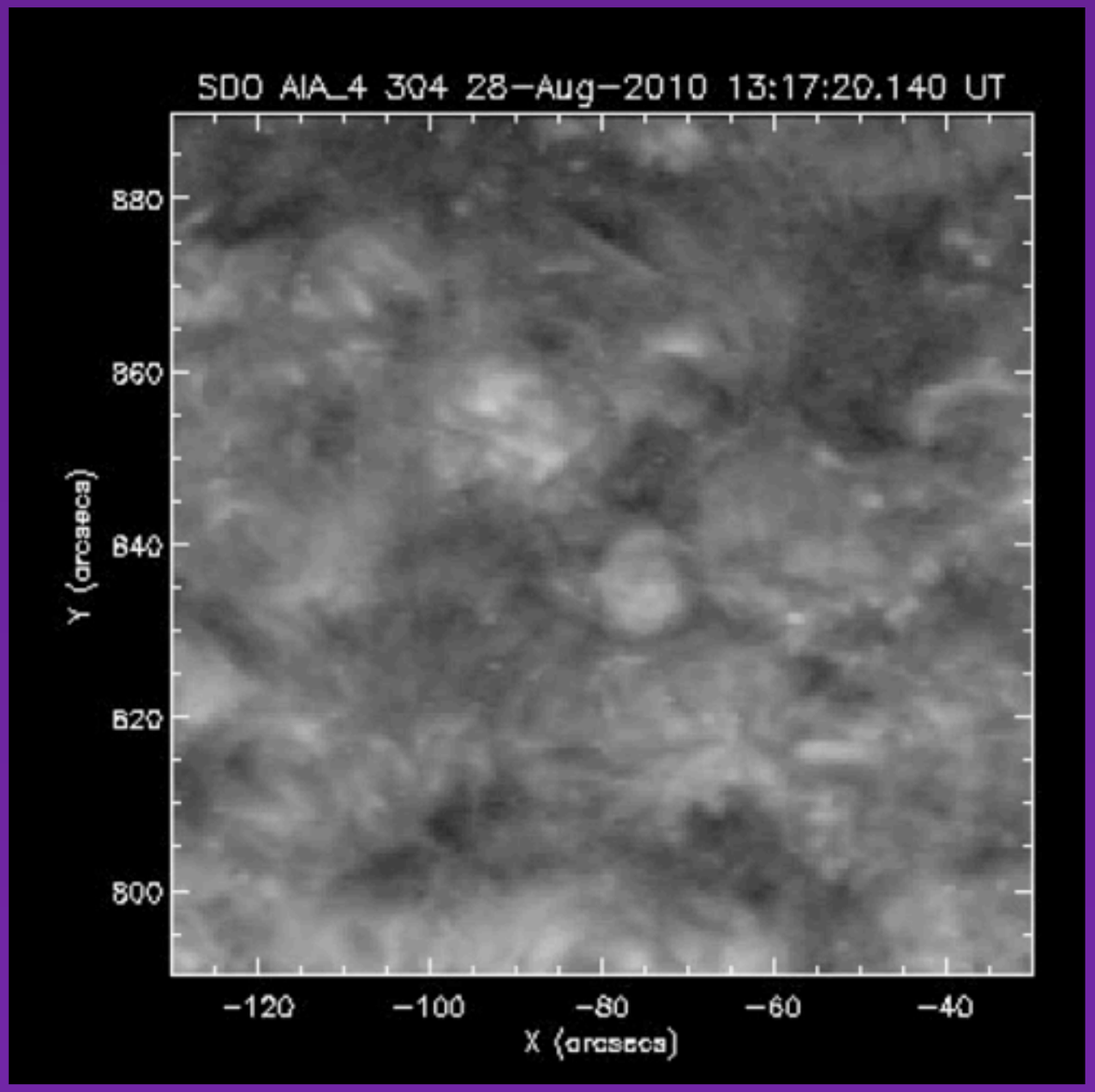
XRT



AIA 304



Event 7

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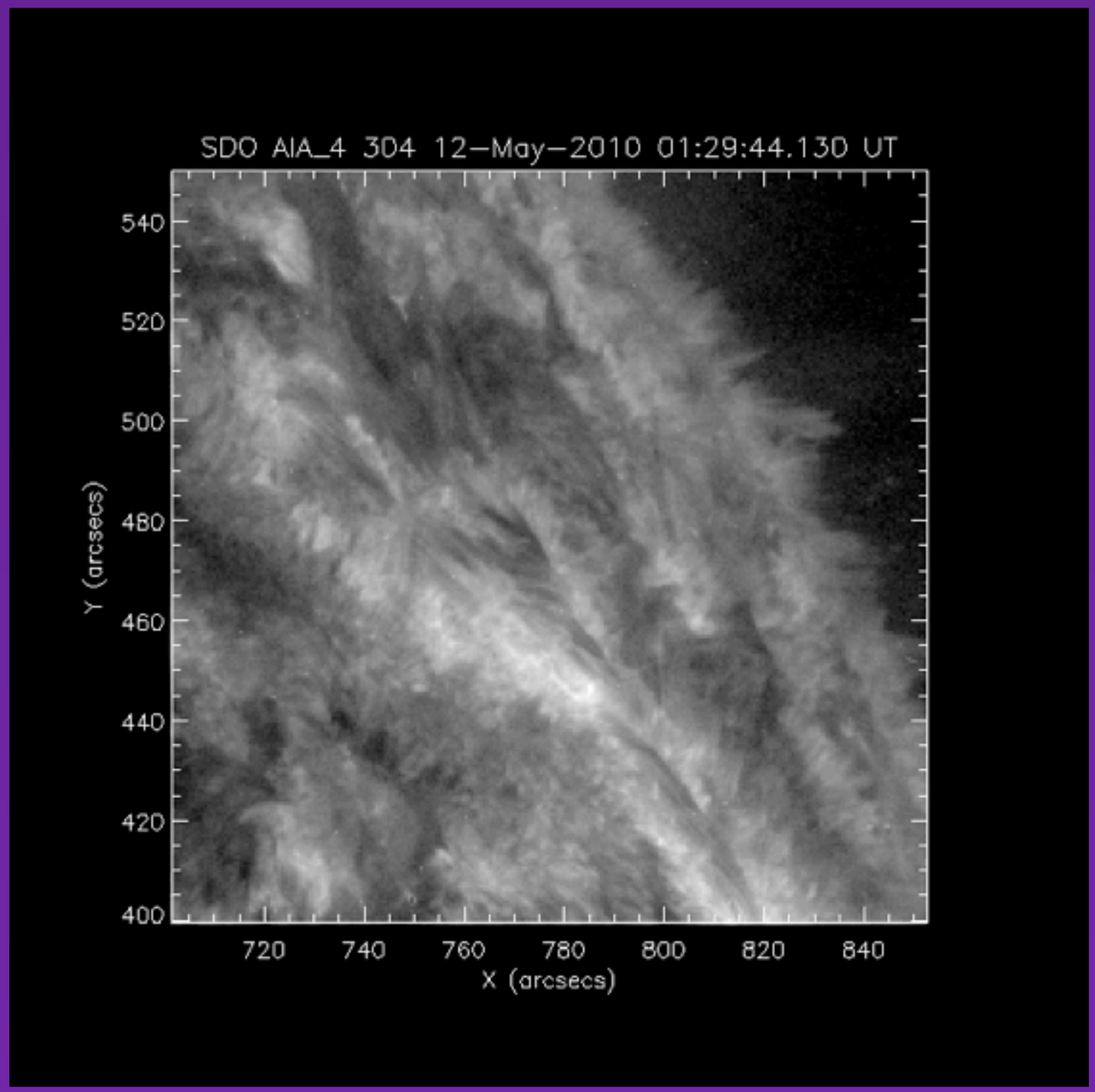
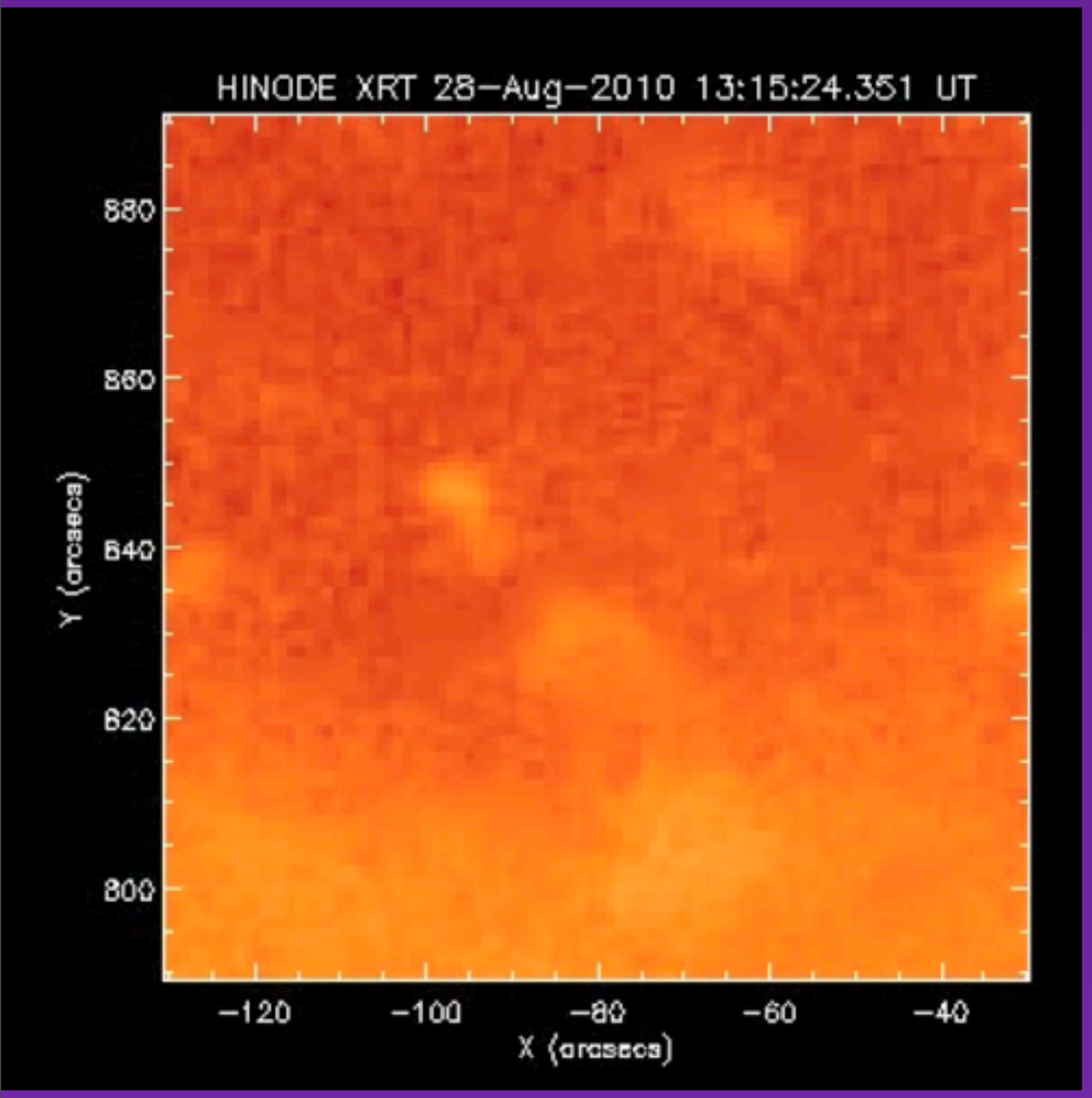


Sterling et al. (2011)

XRT



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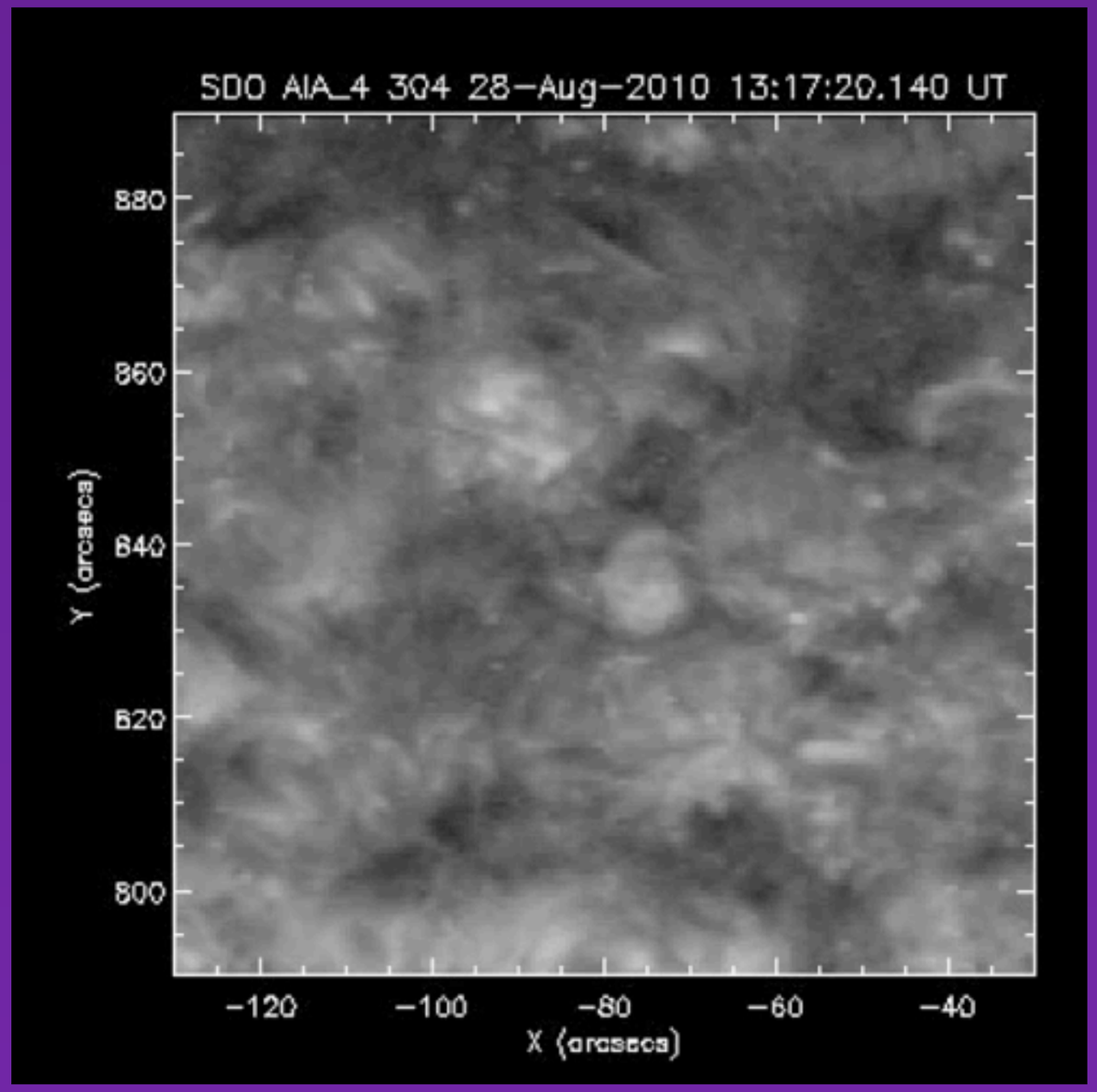

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- Average (over 18 cases) miniature-filament properties:
  - Length ~(8±3)x10^3 km.
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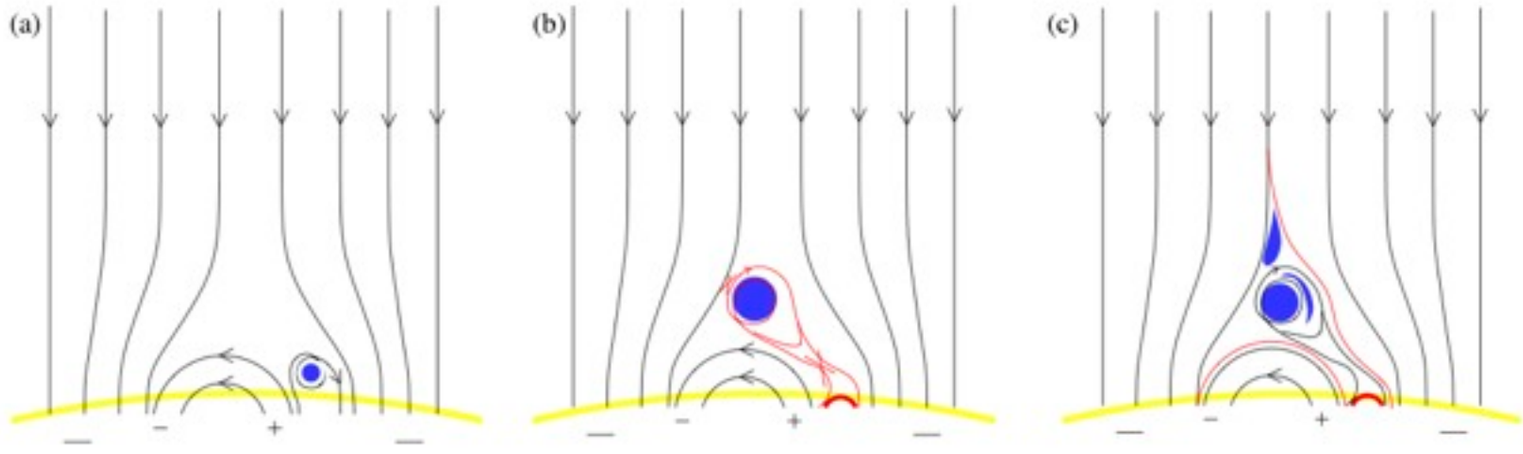

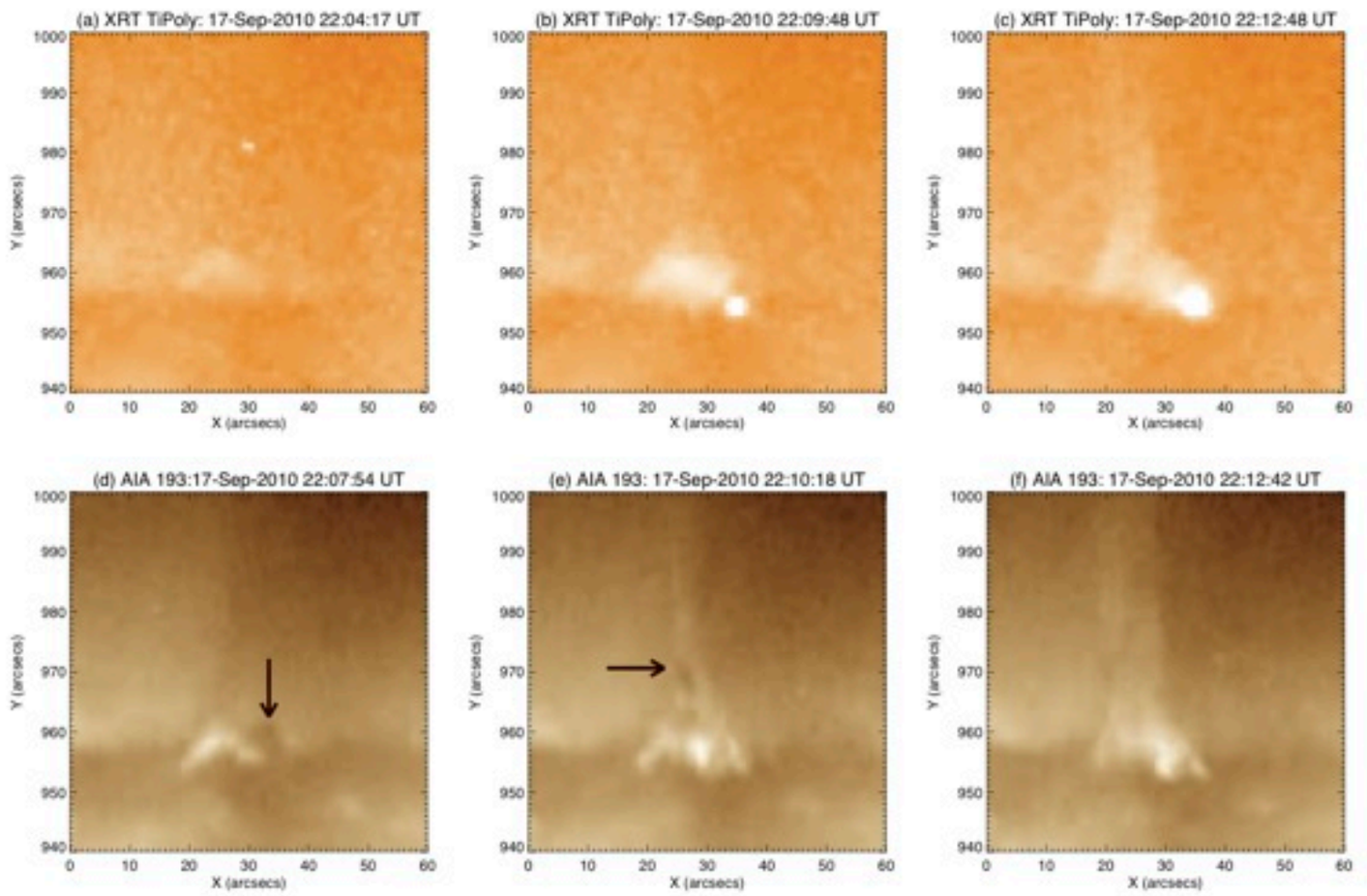

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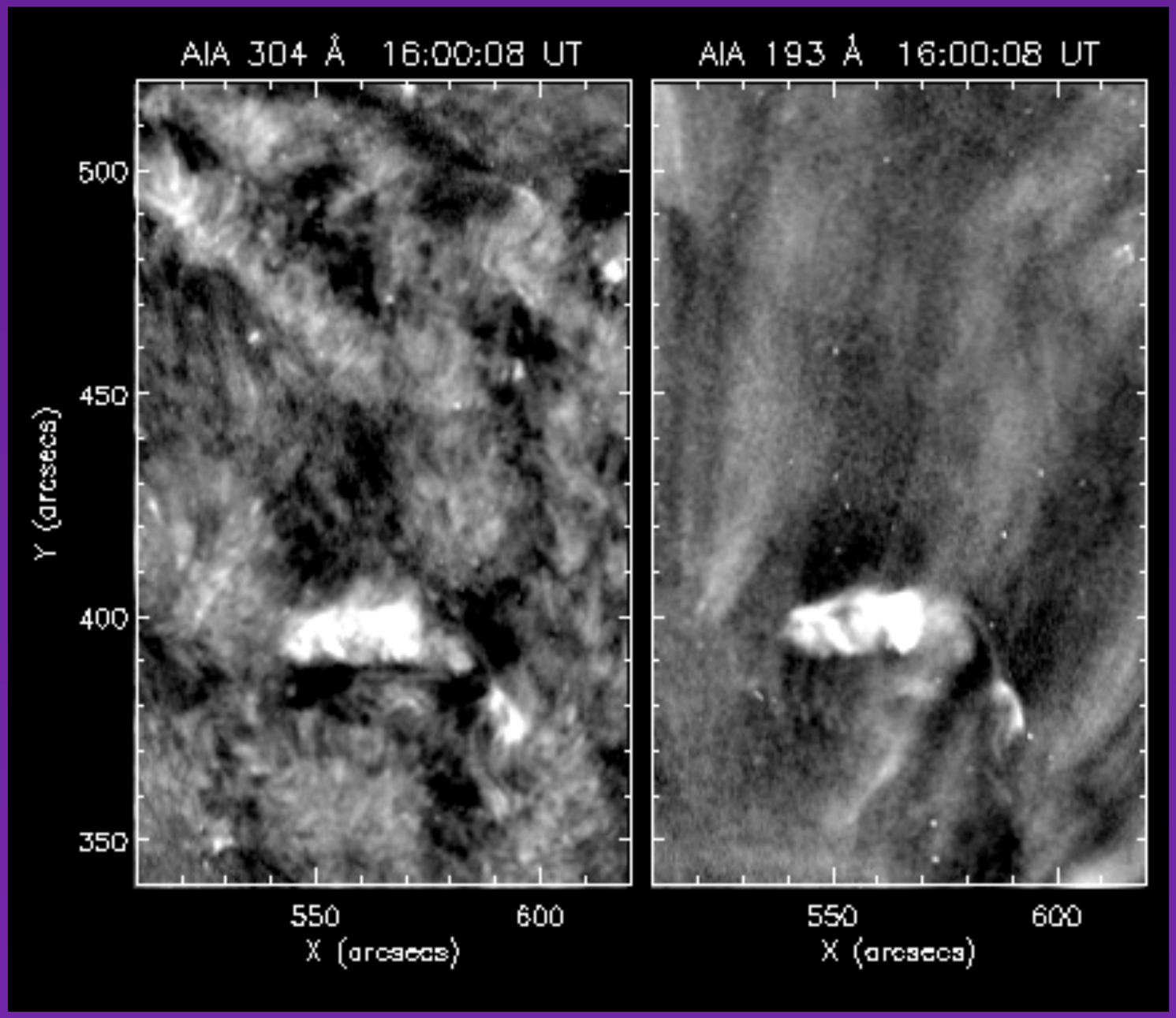

Shen et al. (2012)

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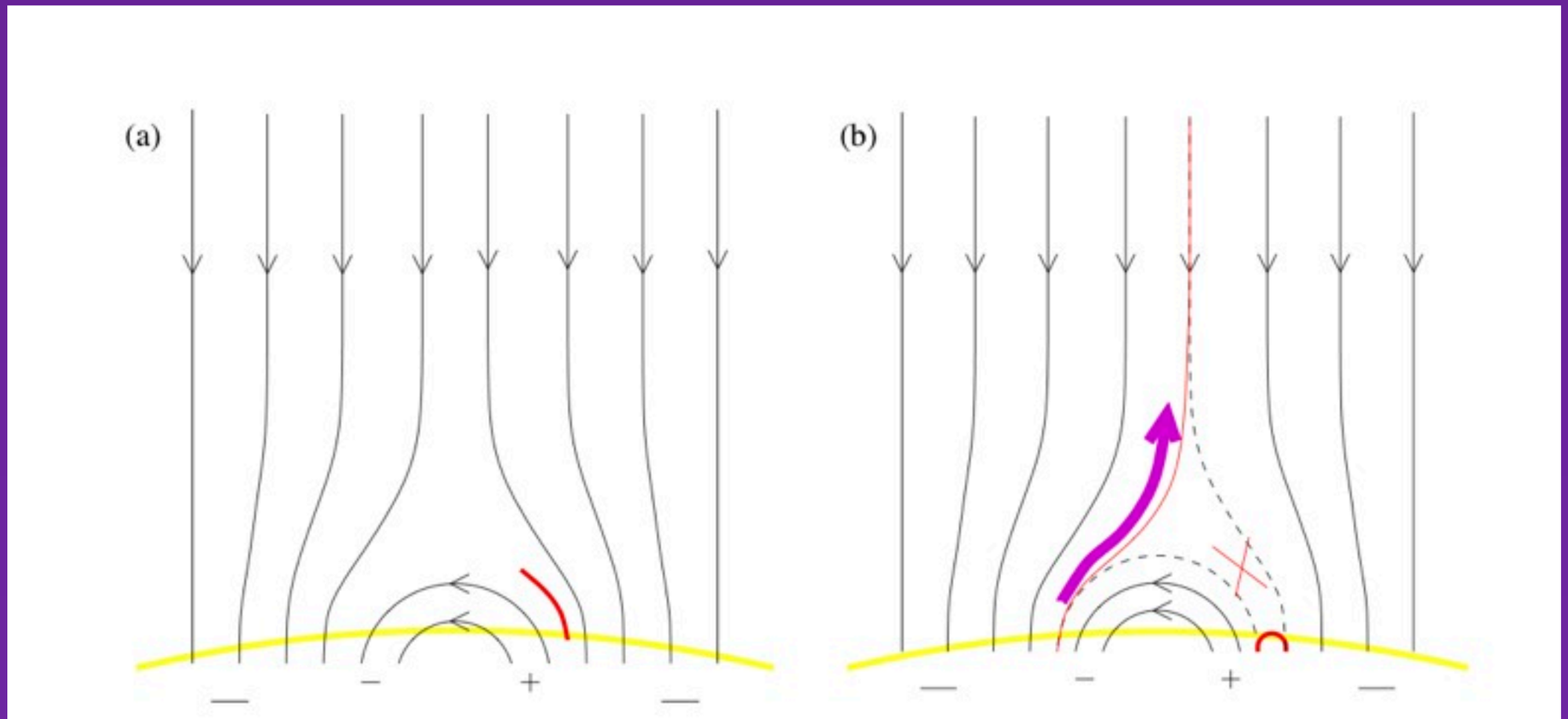

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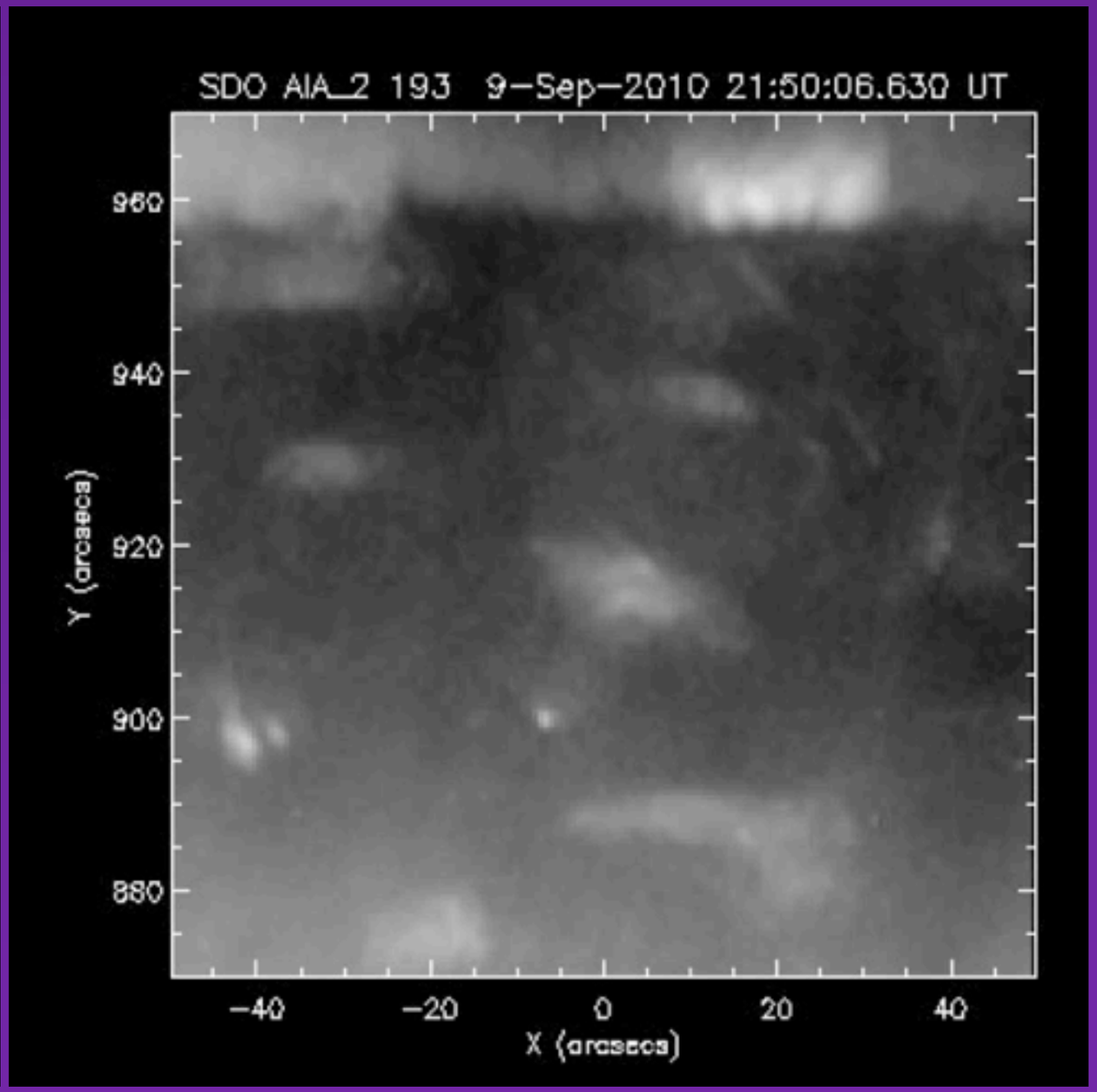
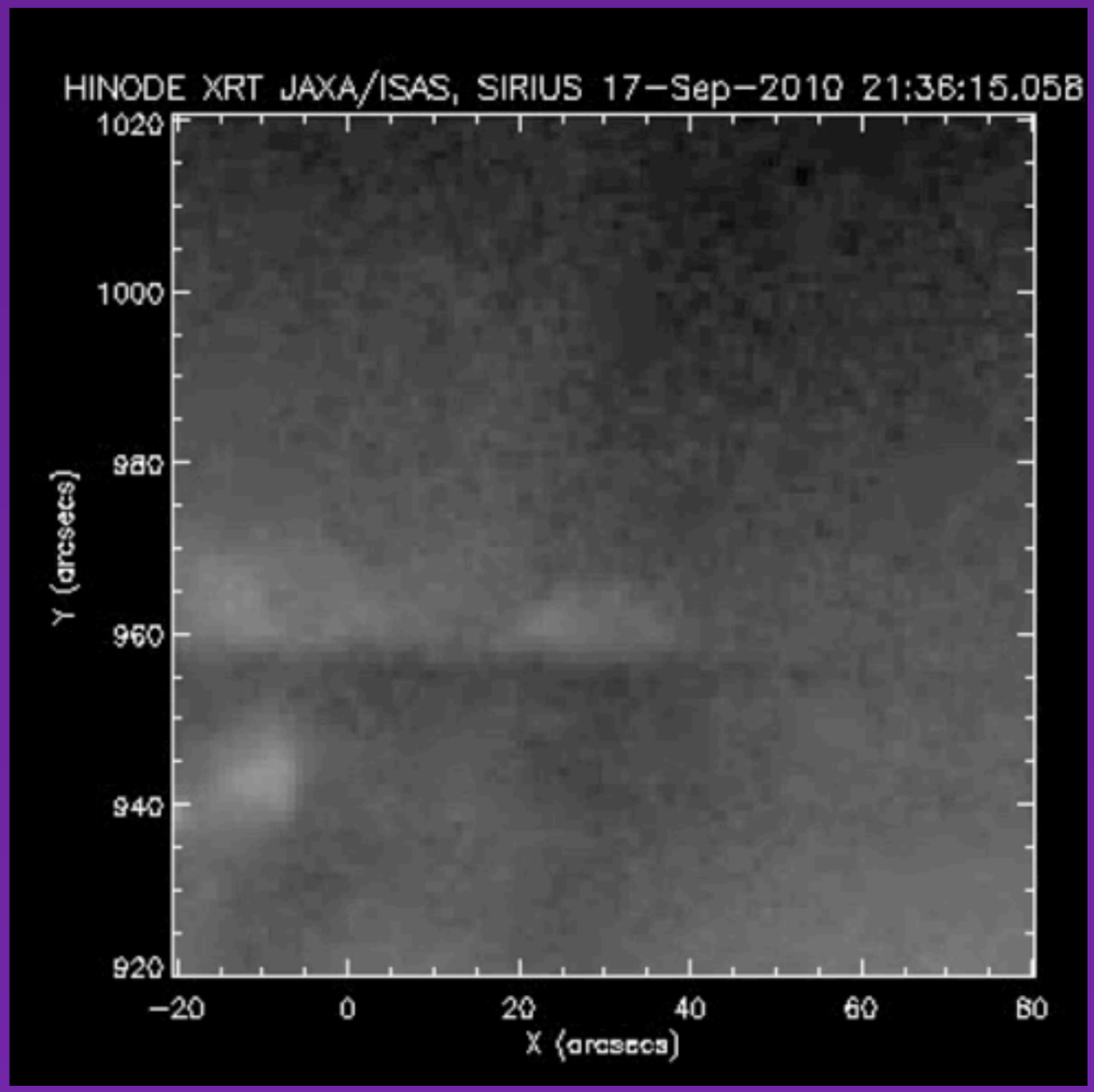
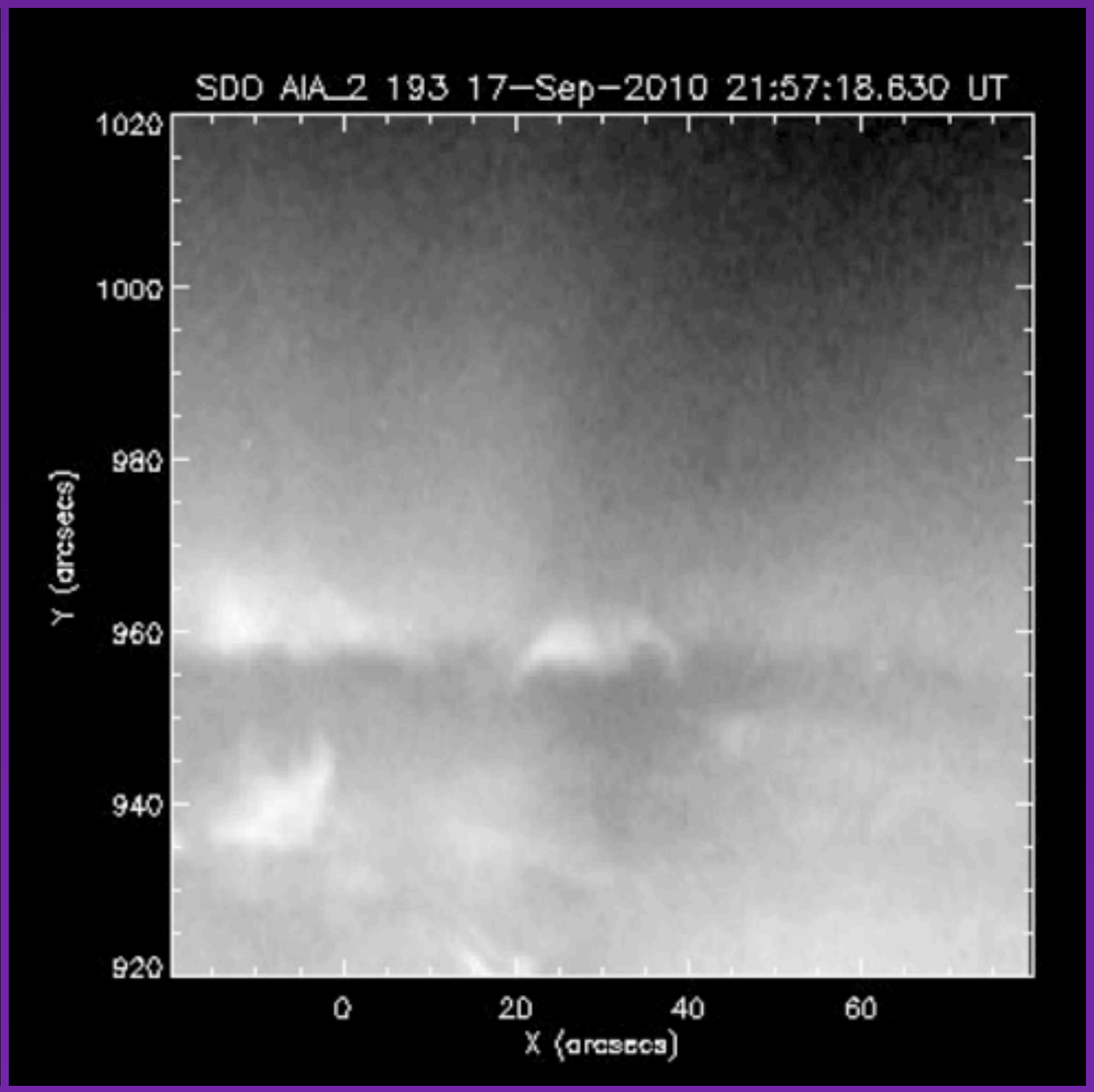


Event 12

XRT

AIA 193





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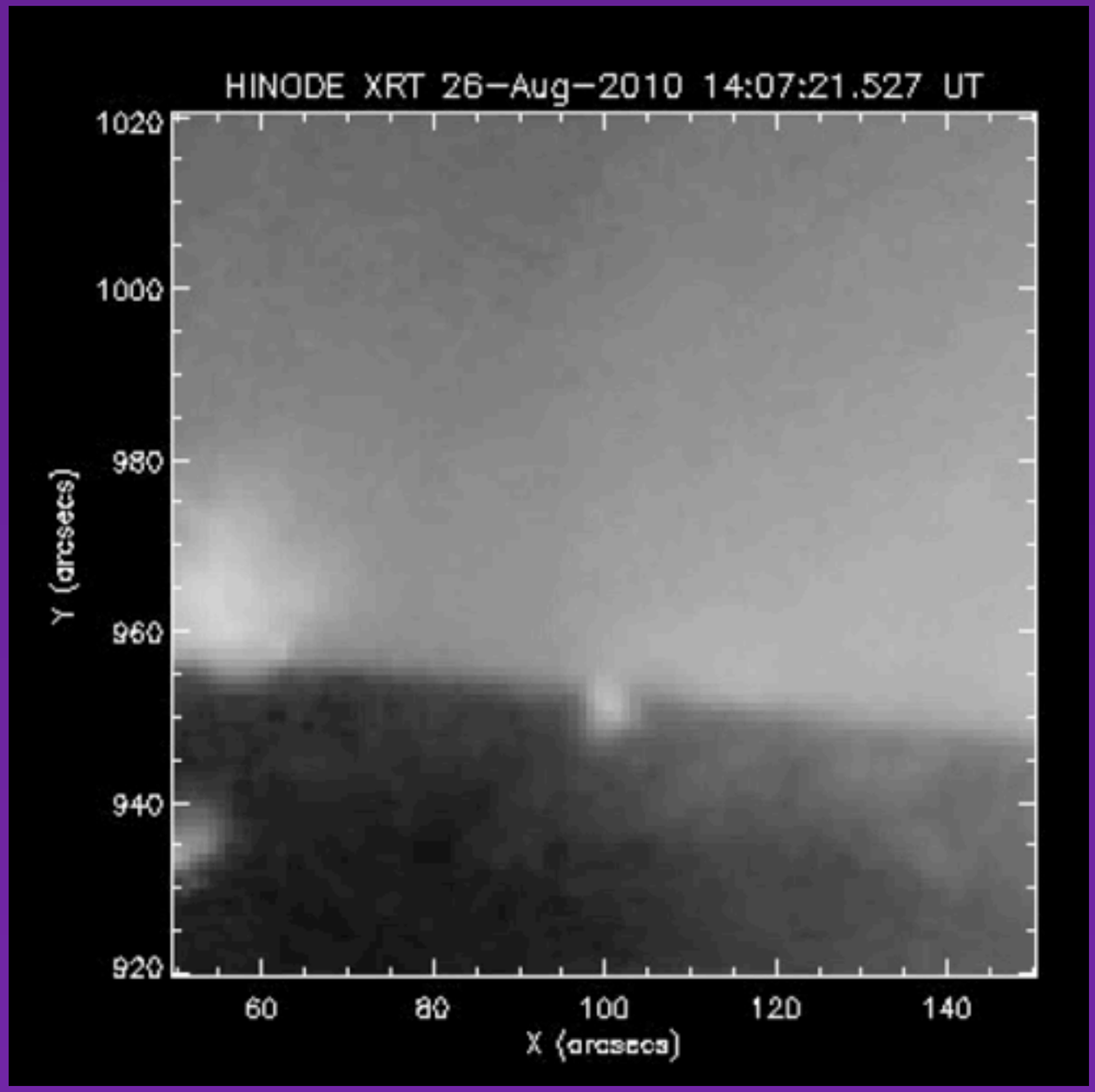
XRT



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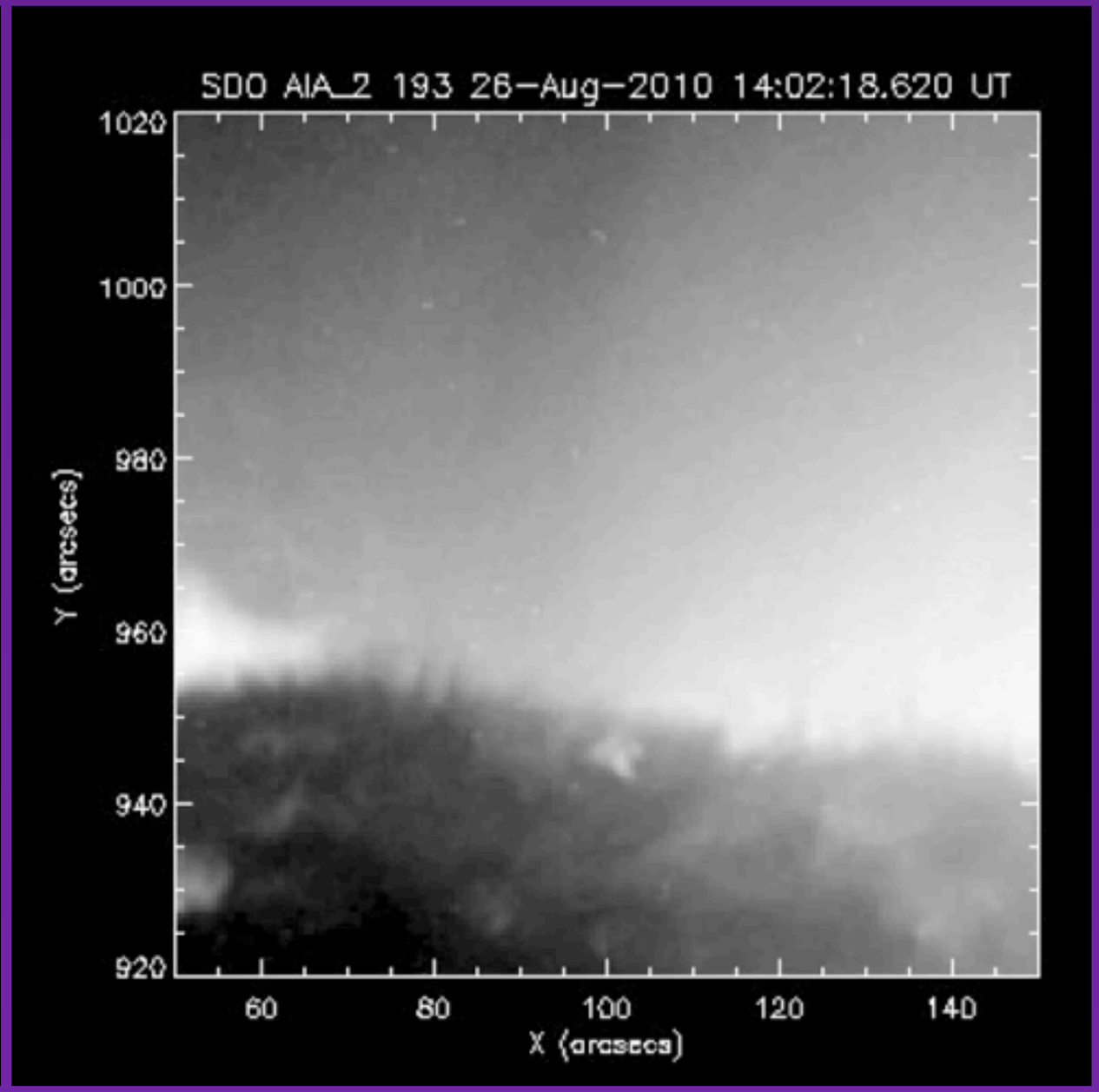

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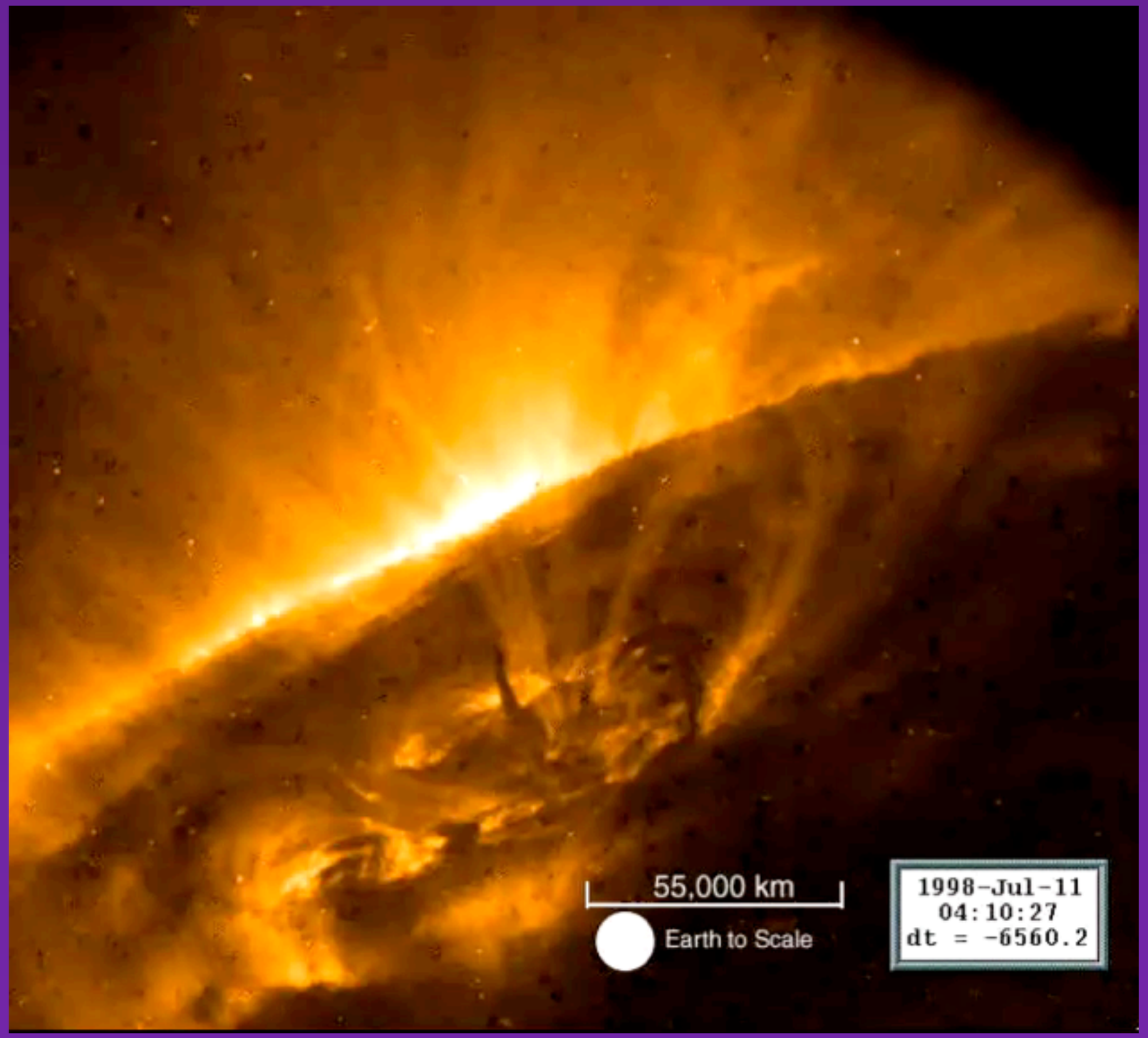

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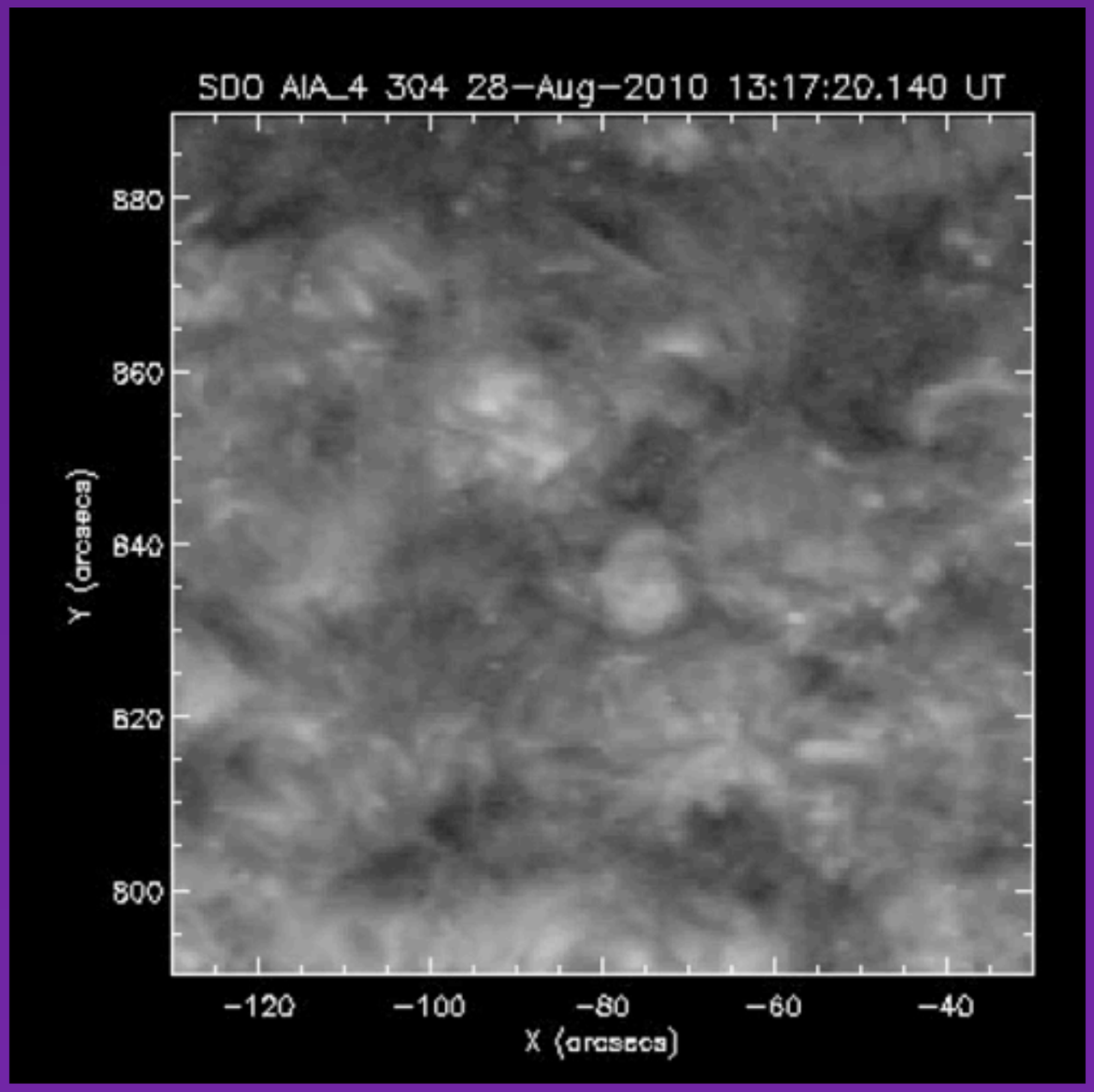
AIA 304



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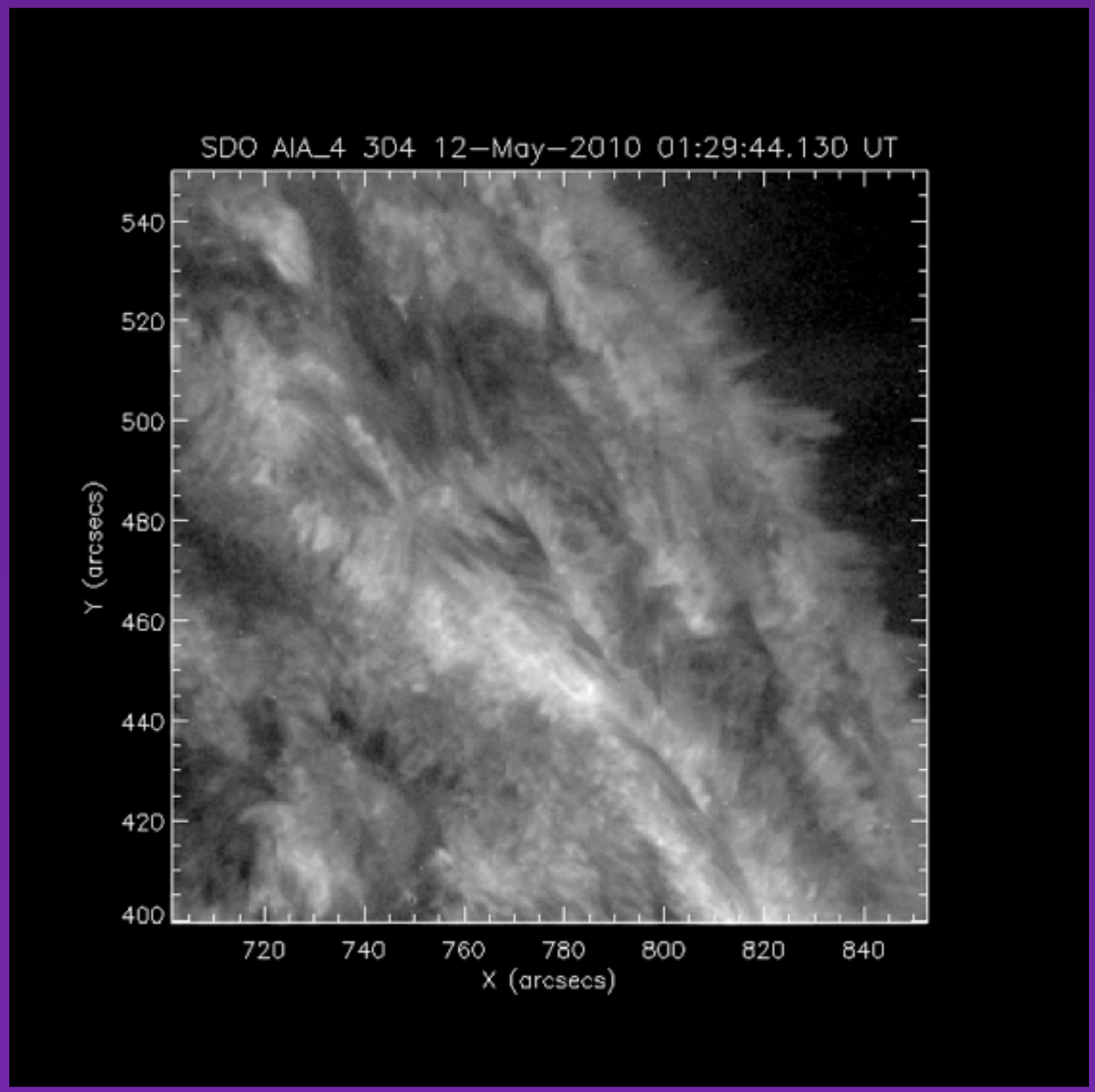
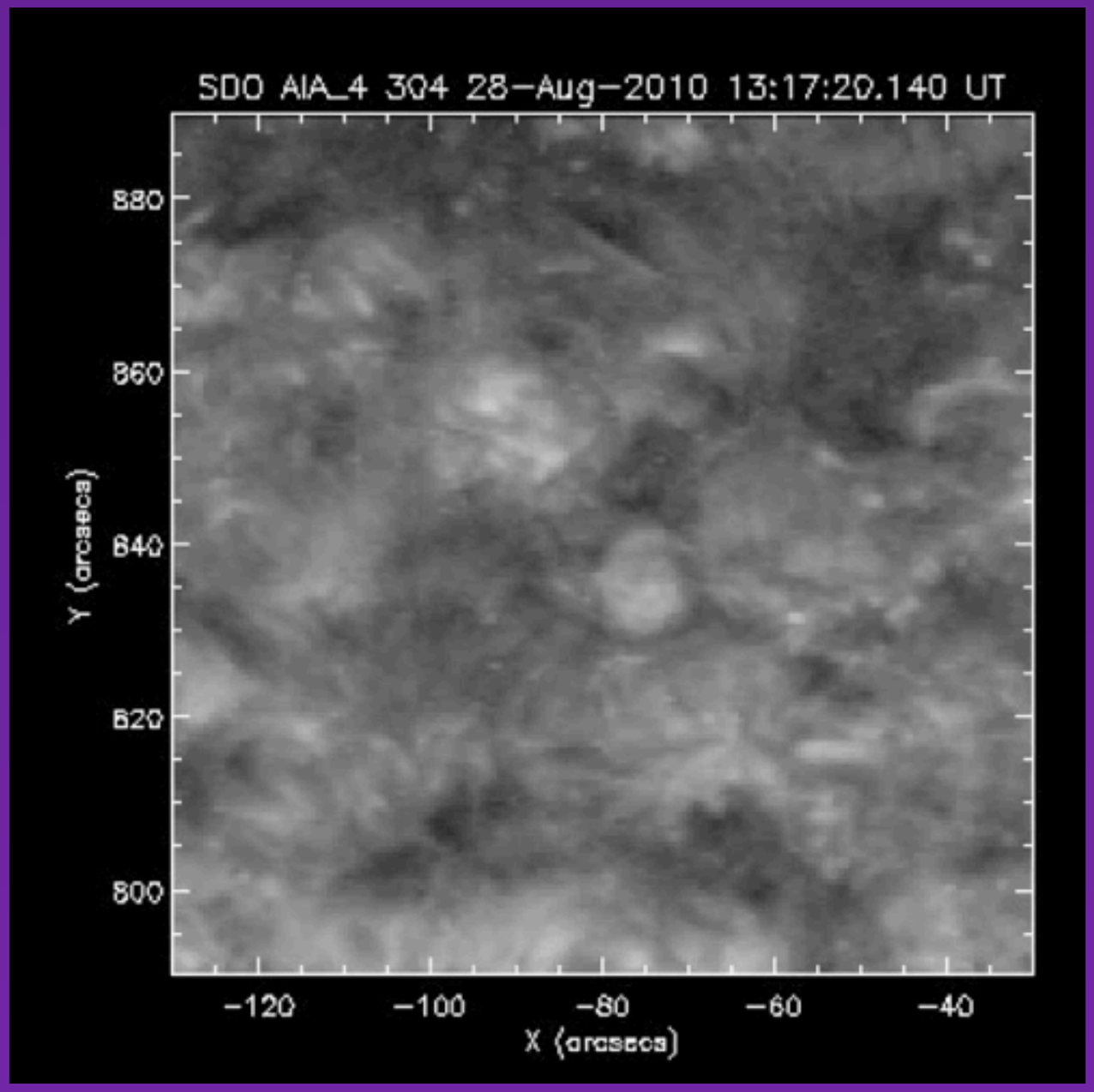


Sterling et al. (2011)

XRT

AIA 304



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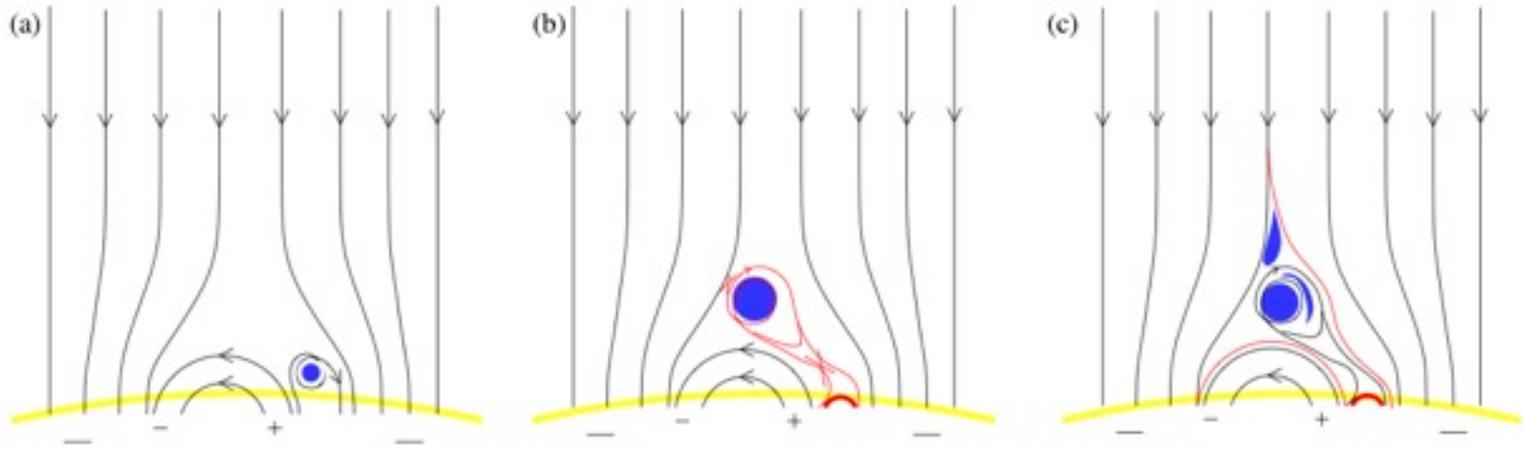

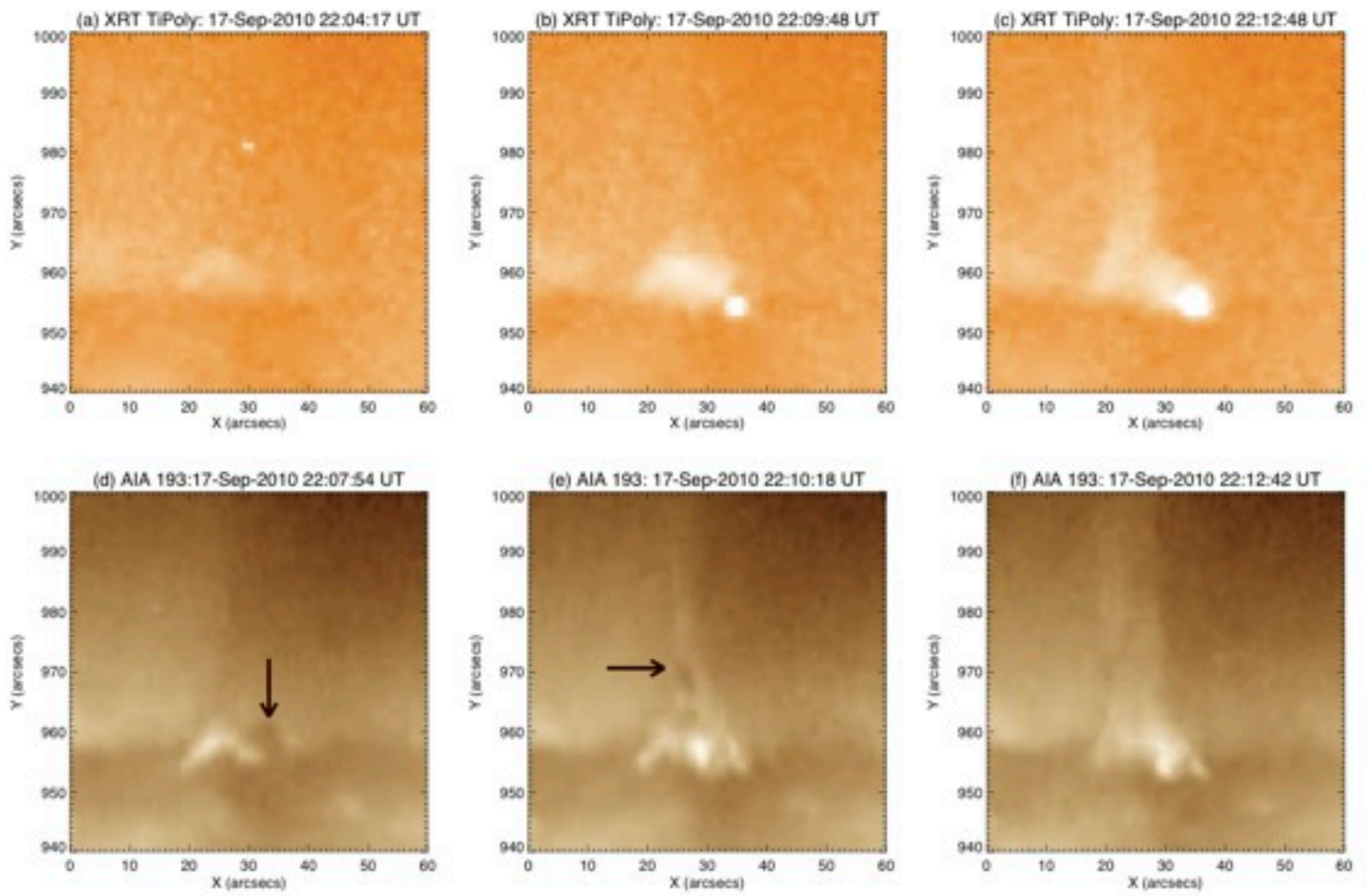

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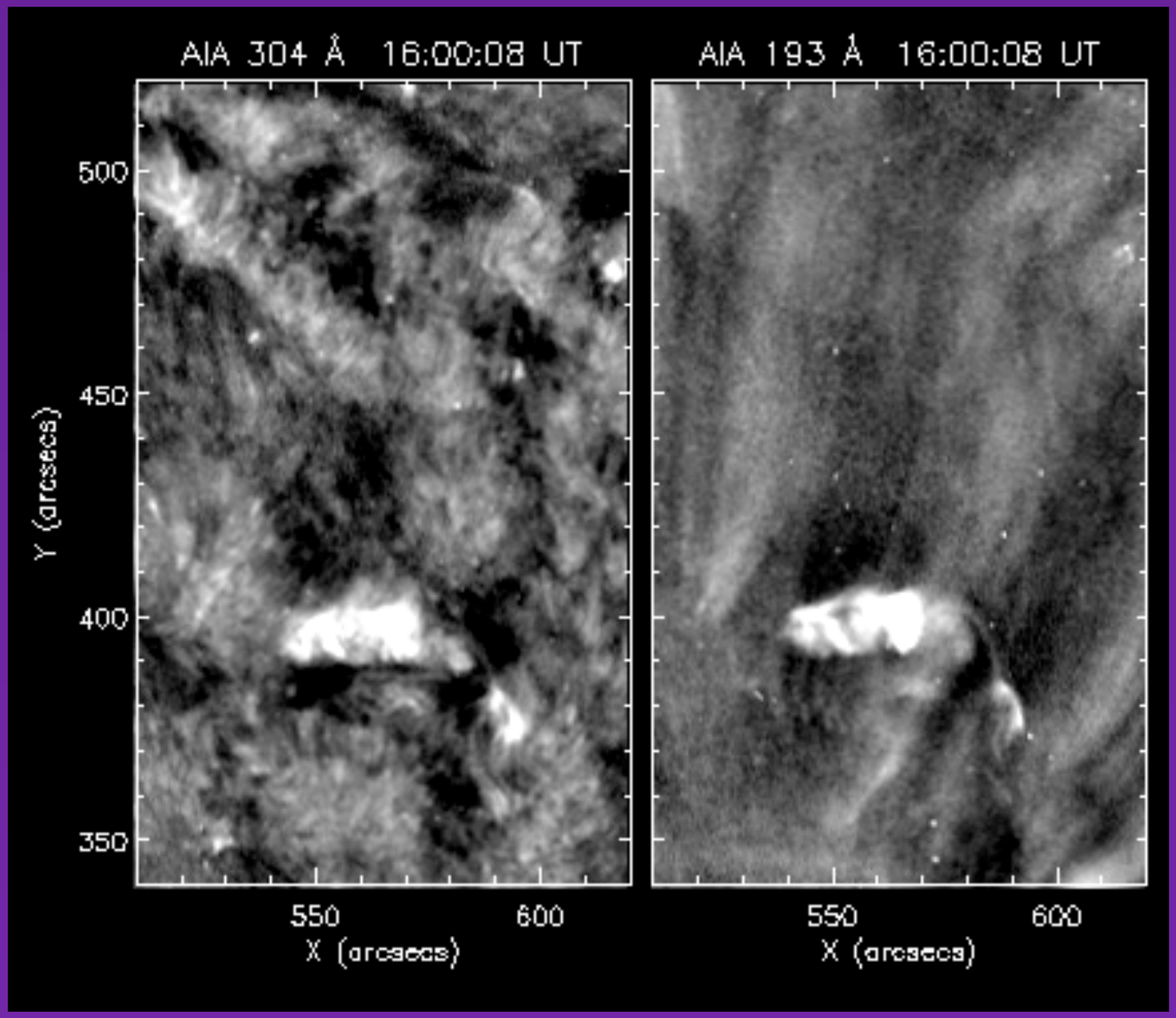

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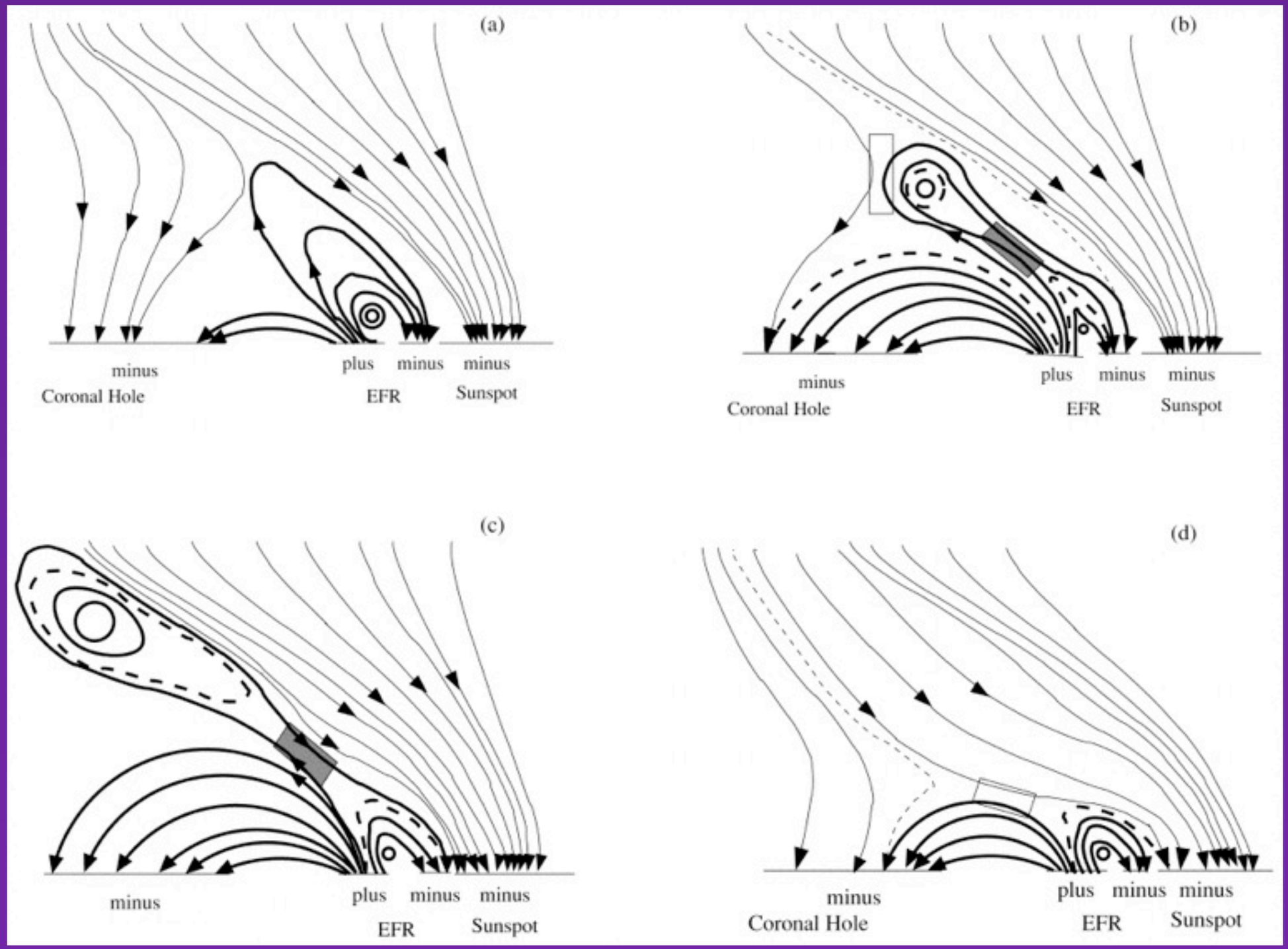

Sterling & Moore (2001)

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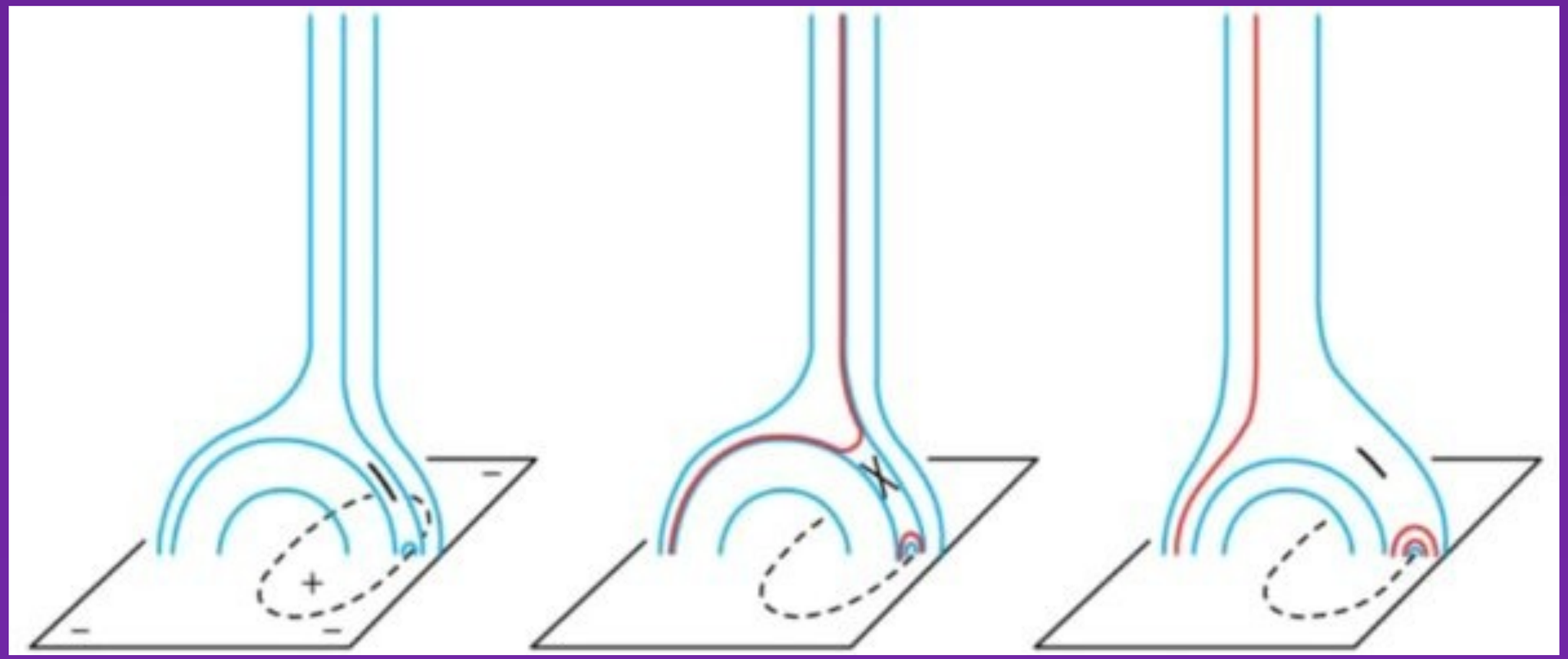

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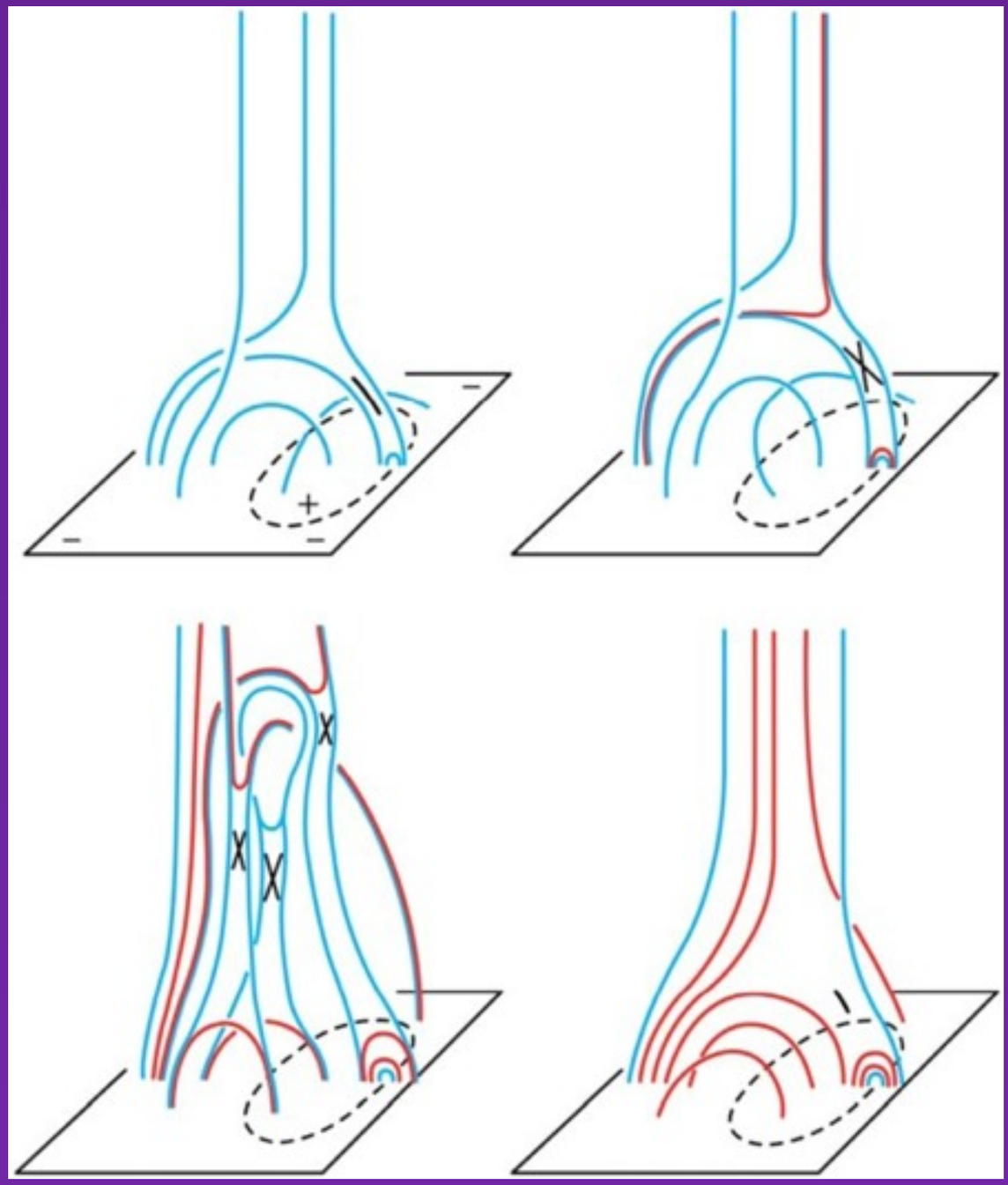

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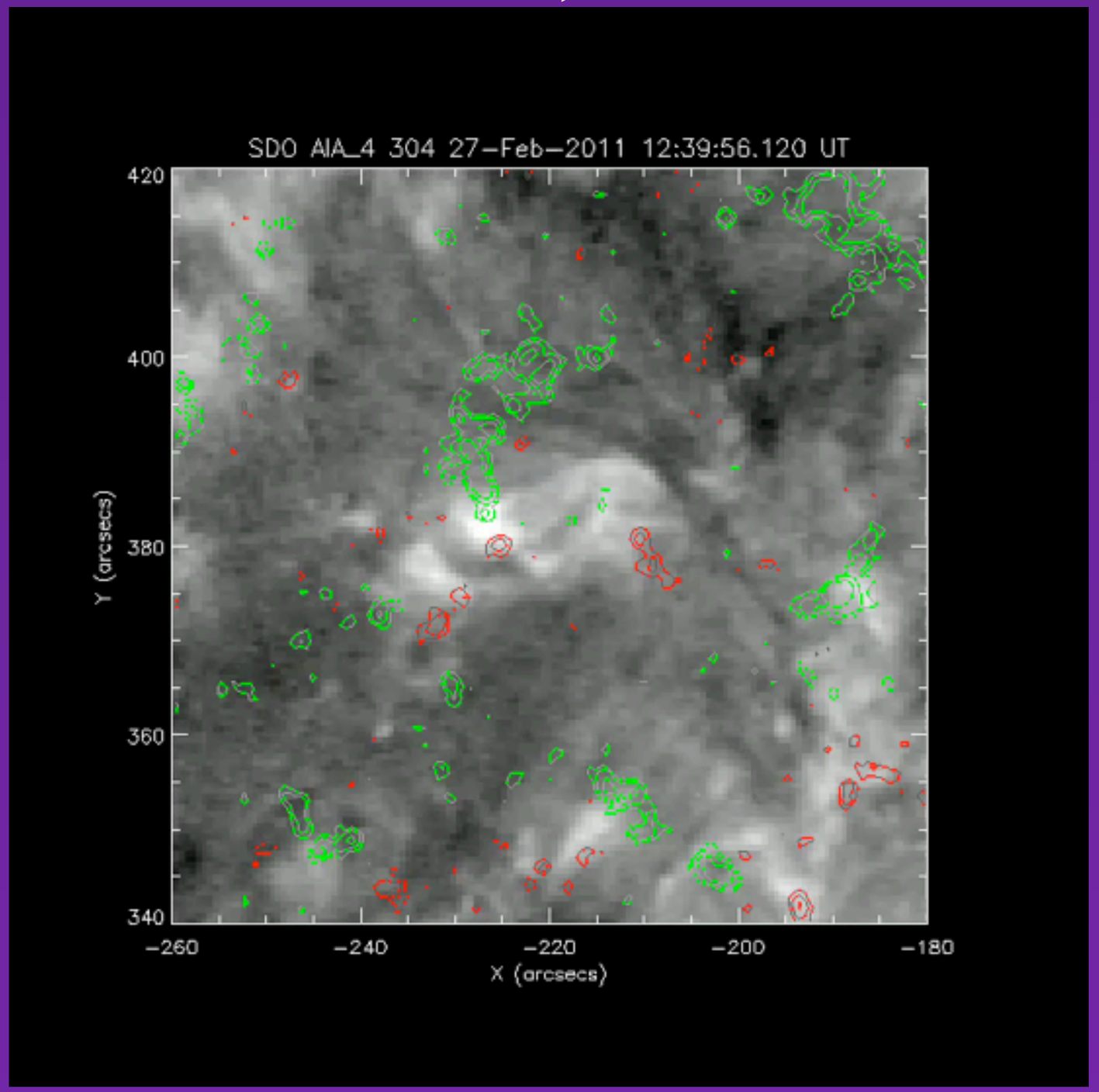
AIA 304, HMI



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