The relationship between the solar flares, EIT waves and radio-bursts?

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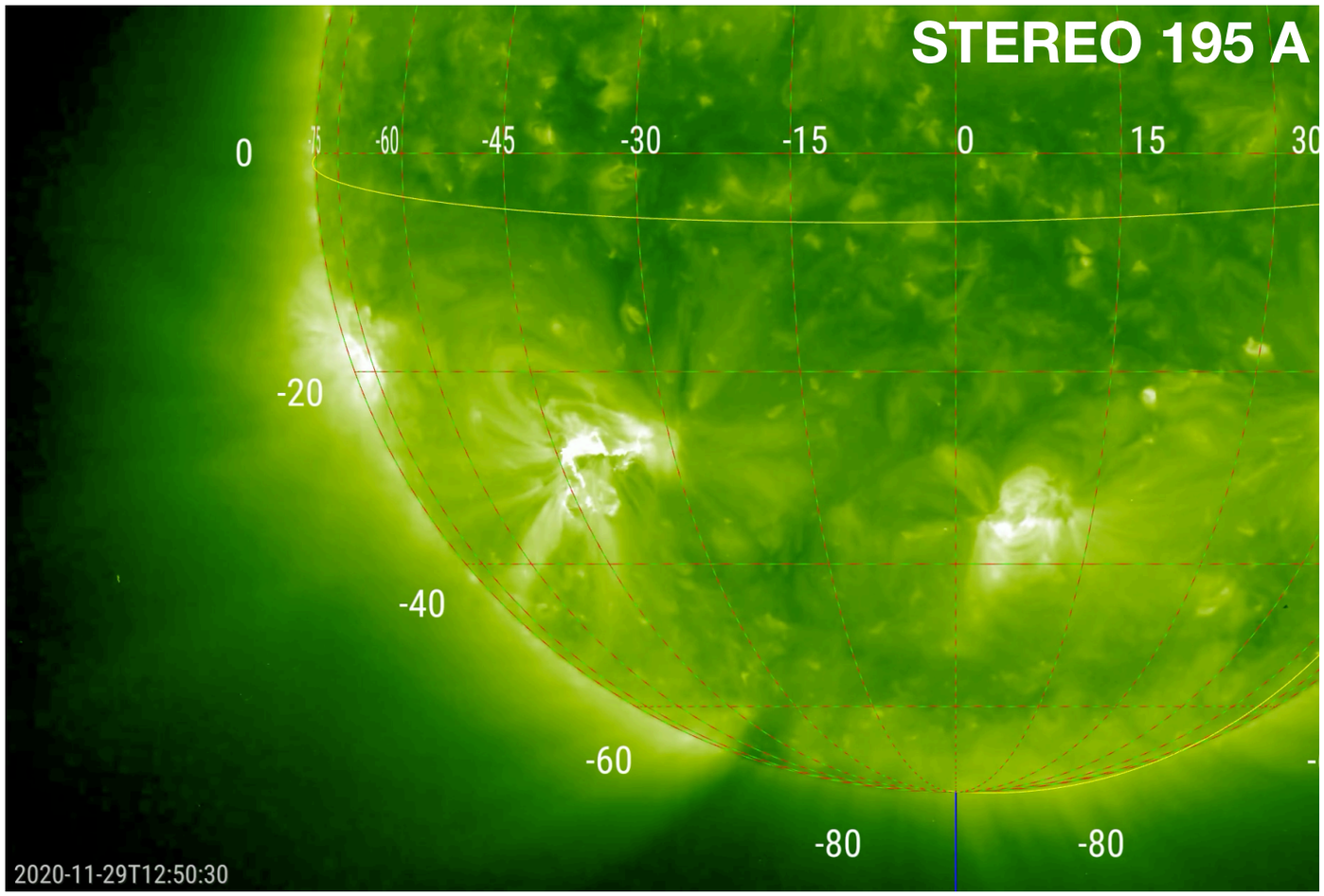
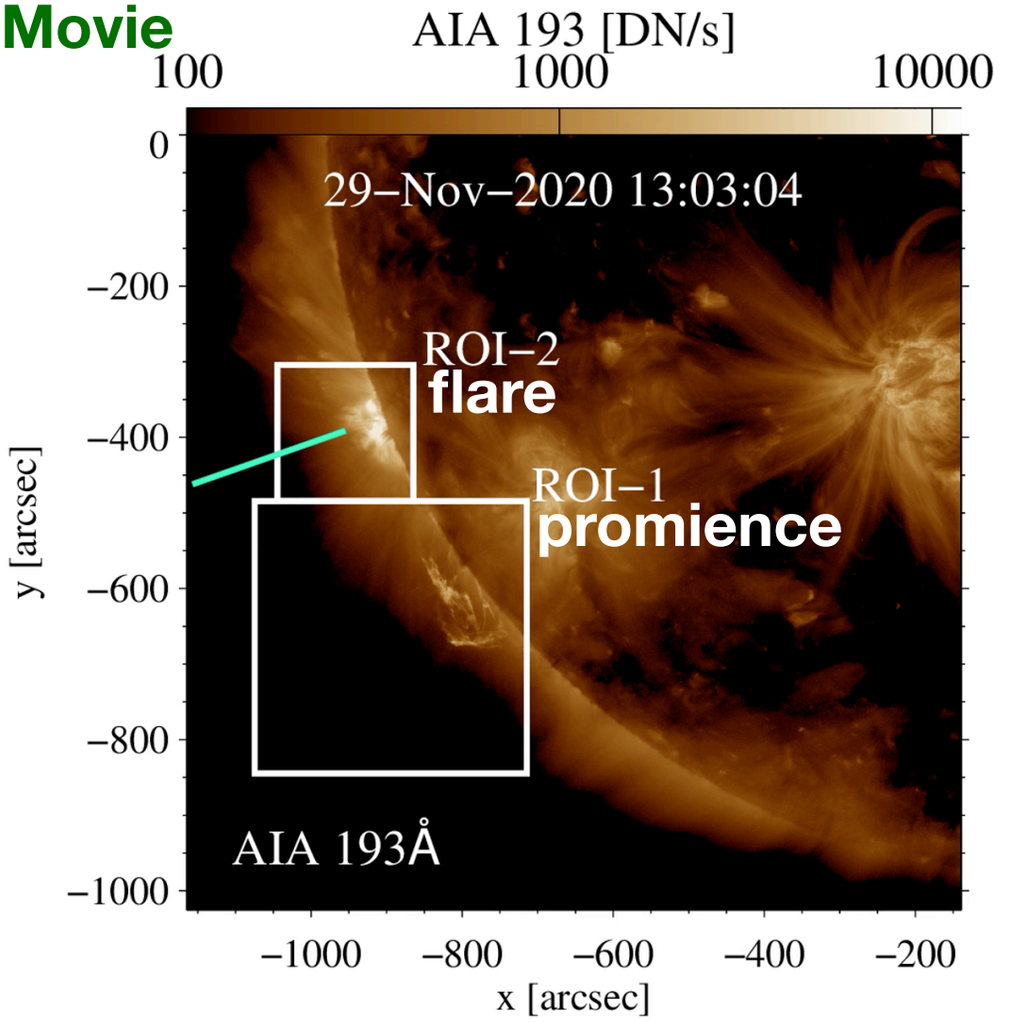
ESPM, 08 Sep 2021

Motivation & Aim

Movie



Movie

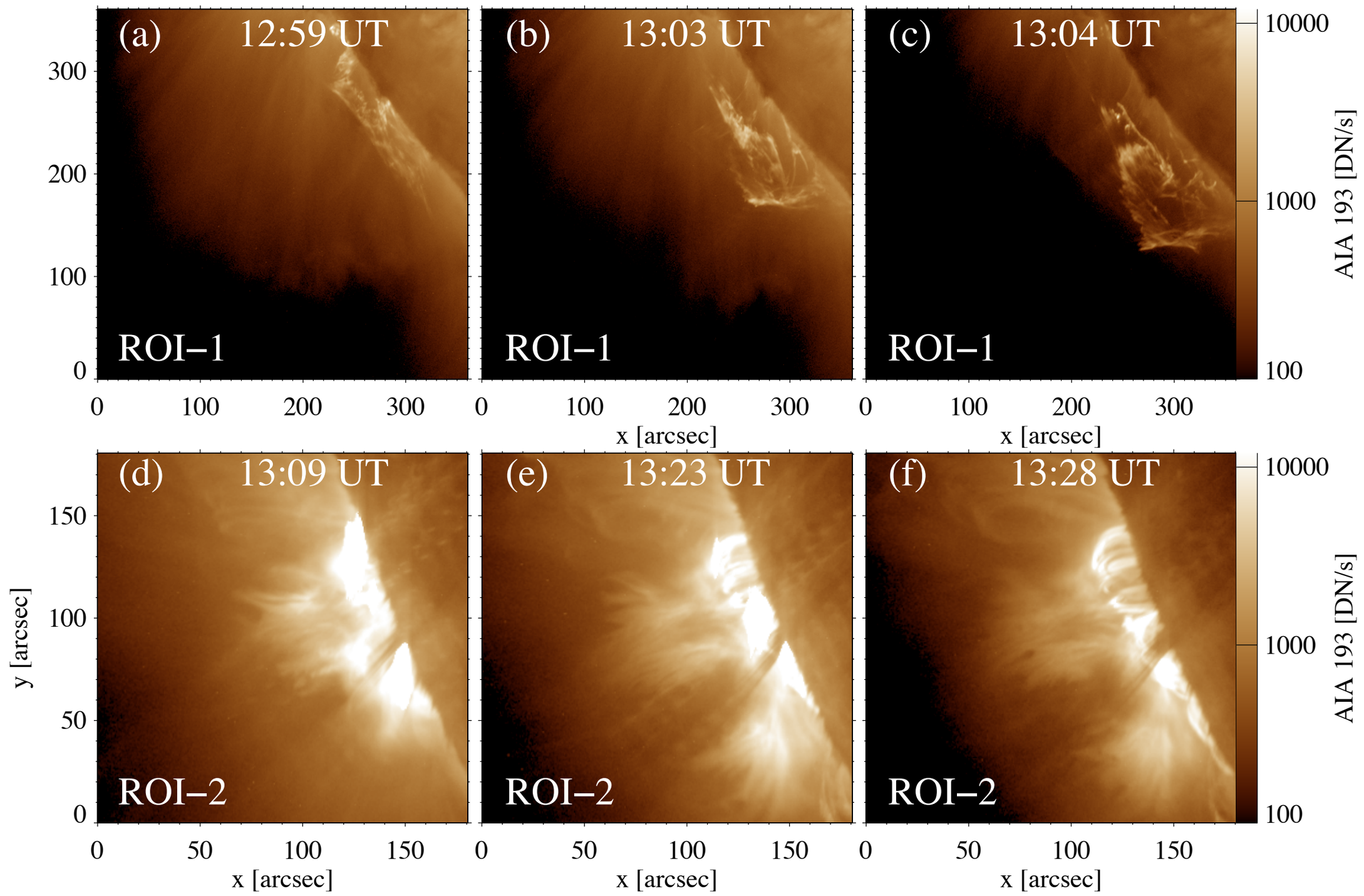


- **Yesterday: Type III burst in non-flaring AR (Harra et al. 2021)**
- **Today: Flaring AR**

- **Multi-instrument observation (SDO, STEREO, PSP, GOES)**
- **AR 12790 (29 Nov 2020)**

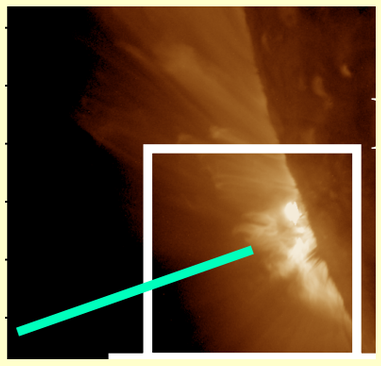
- **What is a relationship between the solar flares, EIT waves and radio-bursts?**

Solar flare & prominence evolution

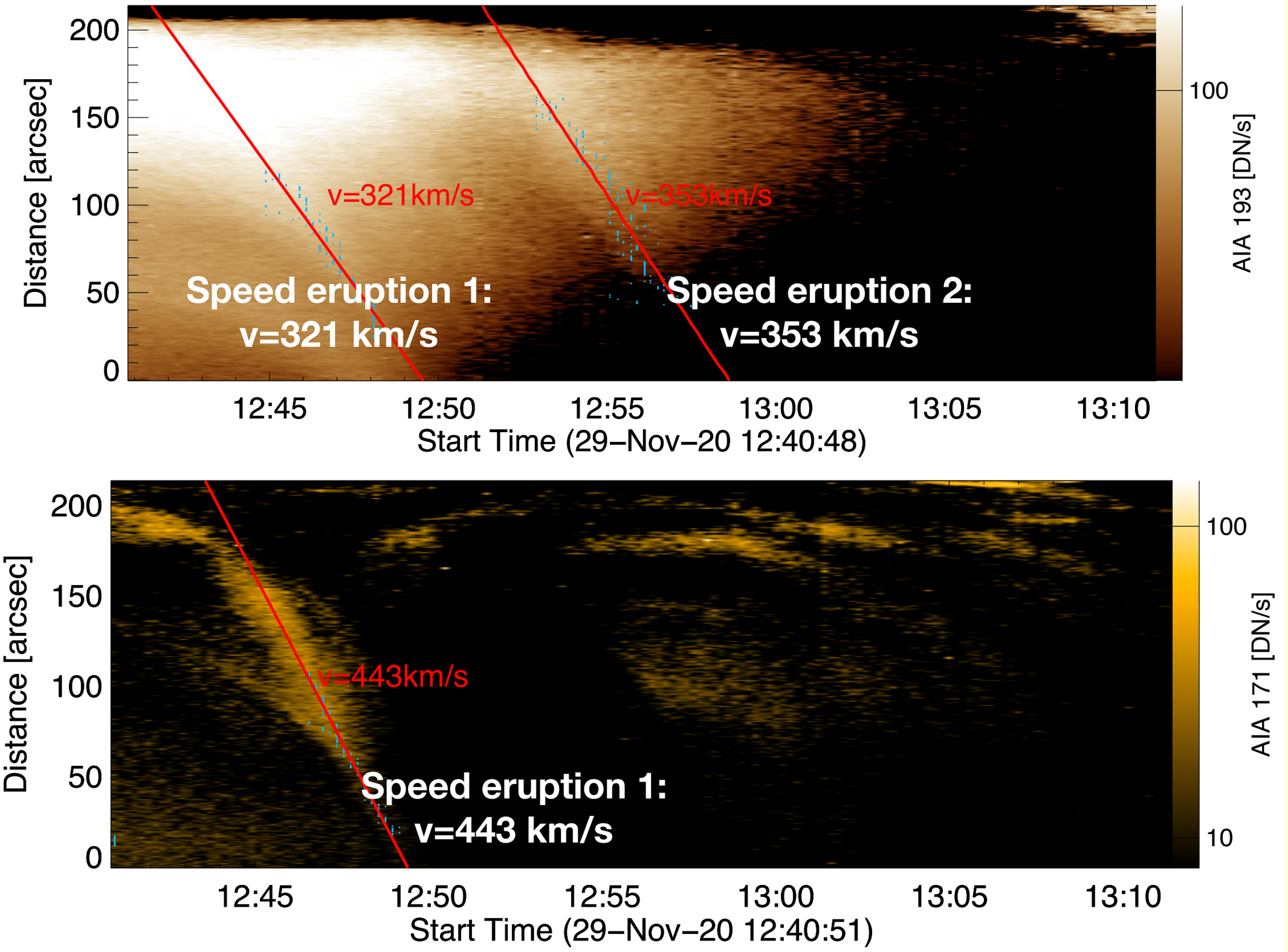


- **(1) Prominence; (2) Flare**
- **More detail analysis of the solar flare evolution is presented by Chitta et. al (2021)**

Temporal evolution of the flare

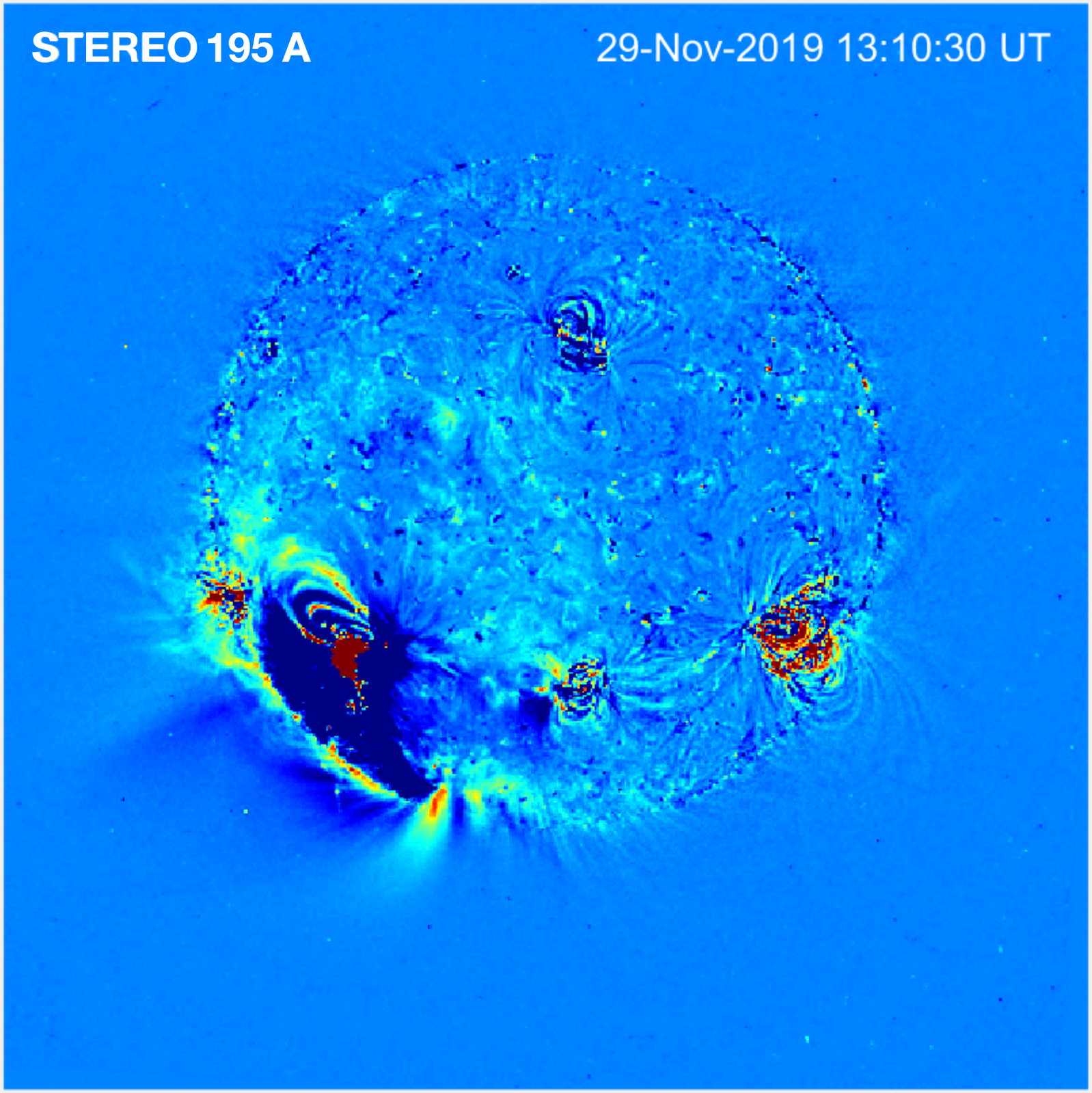


Flare



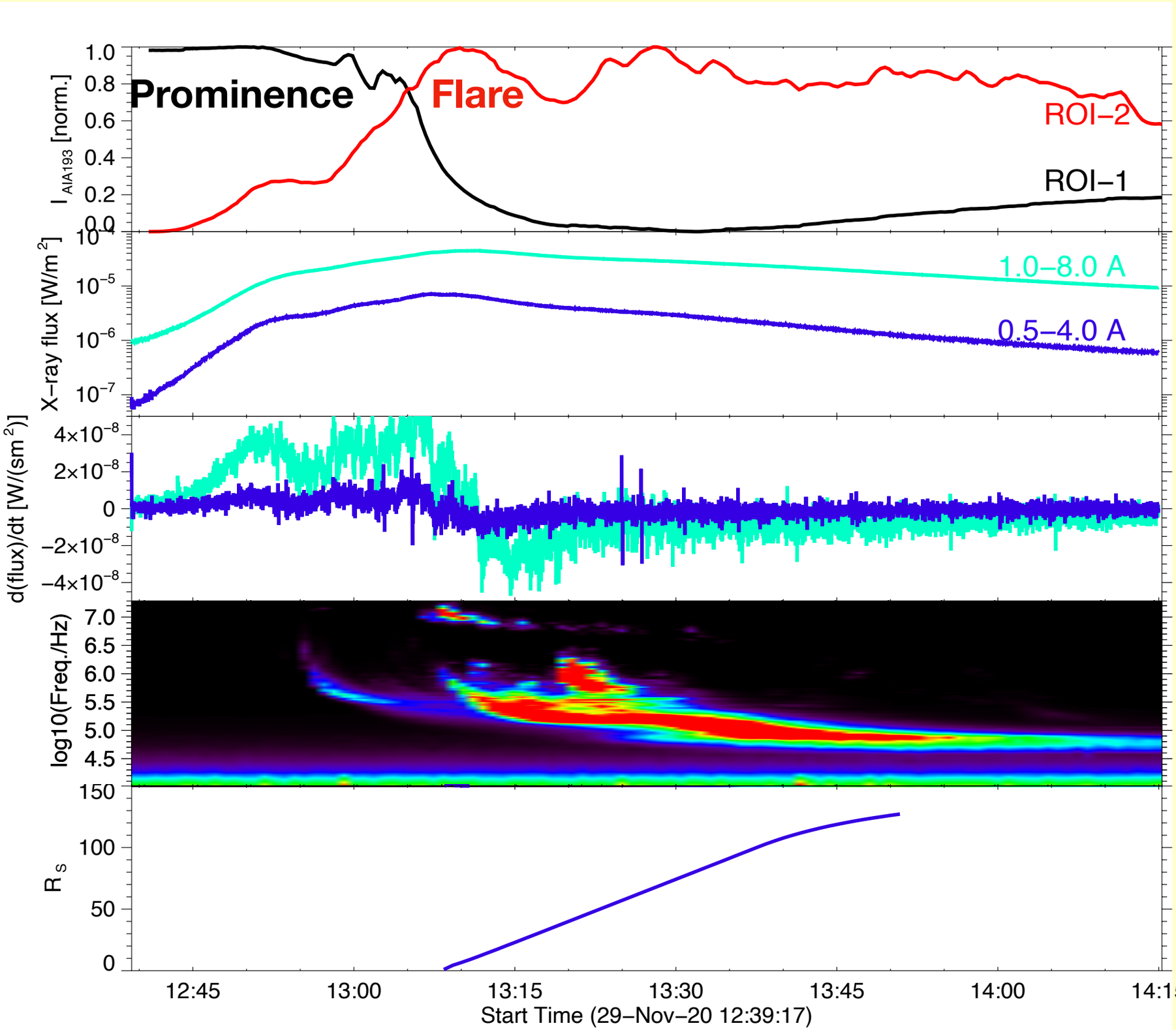
EIT waves

Movie **Dif Derotated Based Difference**



- **M4.4 flare associated with EIT wave**
- **Propagation with constant speed of 372 km/s (similar to AIA193)**
- **the EIT wave is the earliest CME signature (Zhukov et al. 2004)**

Radio-bursts



- **type III bursts**

related to electrons beams that are accelerated by magnetic field reconnection during the flare.

- **CME**

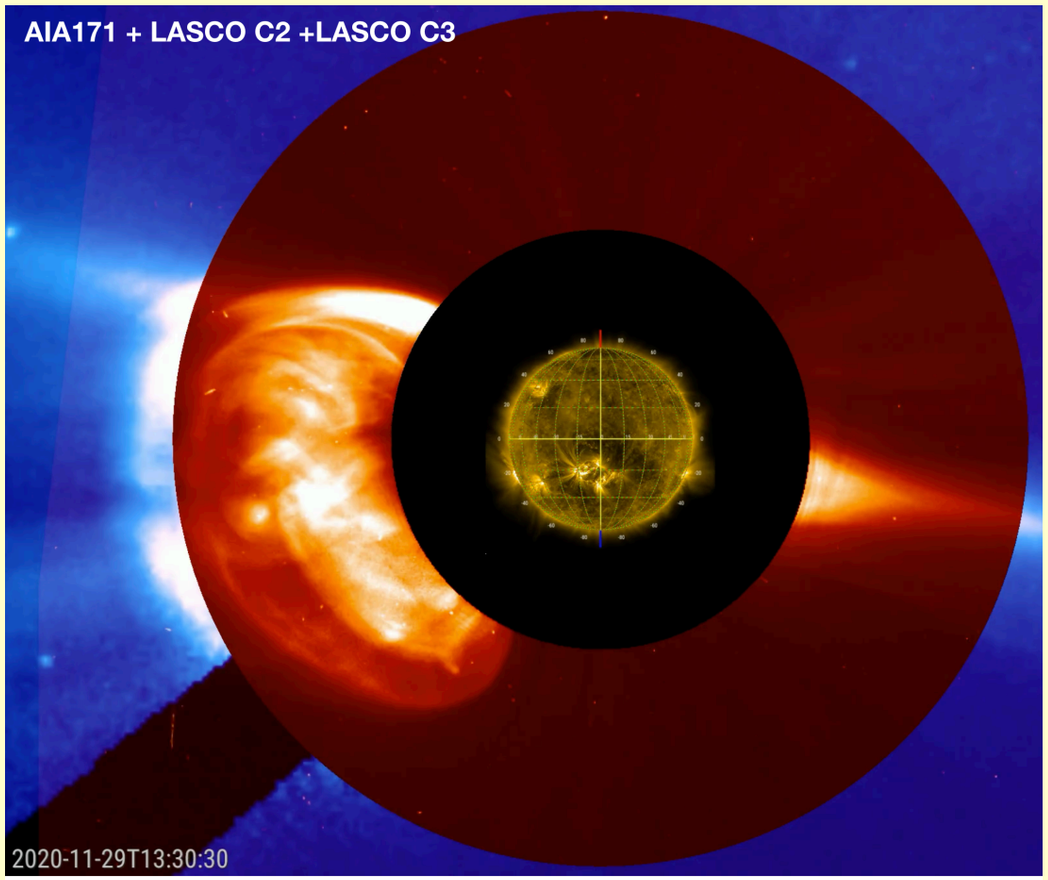
- **type II bursts**

related to propagation of a MHD wave in the corona resulting from CME propagation.

Conclusion

- **We present the comprehensive overview of the eruptive event:**

-prominence
-flare
-EIT wave
-type III burst
-CME & type II burst



- **The EIT wave velocity can be similar to CME velocity in EUV observed corona**

Reference

- **Chitta et al. (2021); From Formation to Disruption: Observing the Multiphase Evolution of a Solar Flare Current Sheet; 2021, ApJ, 911, 133**

- **Harra et al. (2021); The active region source of a type III radio storm observed by Parker Solar Probe during encounter 2; 2021, A&A, 650, 7**

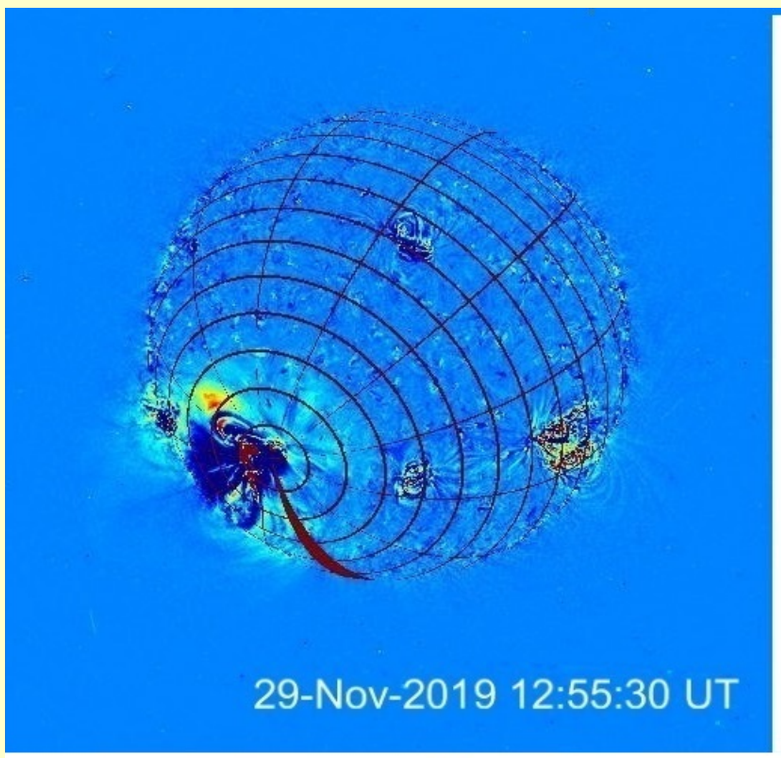
- **Ma et al. (2009); A New View of Coronal Waves from STEREO; 2009, ApJ, 707, 503**

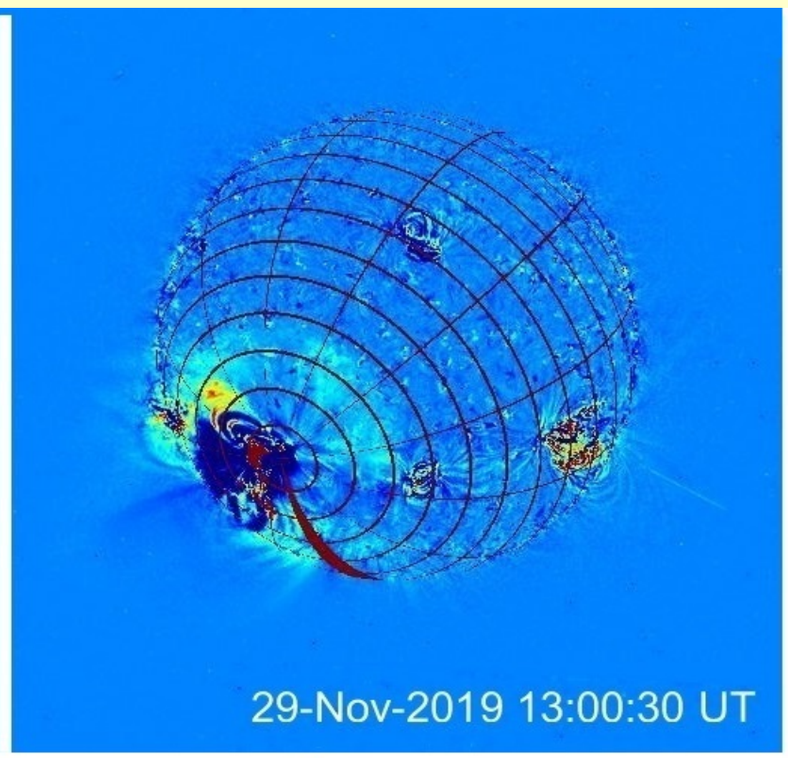
- **Zhukov et al. (2004); On the nature of EIT waves, EUV dimmings and their link to CMEs; 2004, A&A, 427, 705**

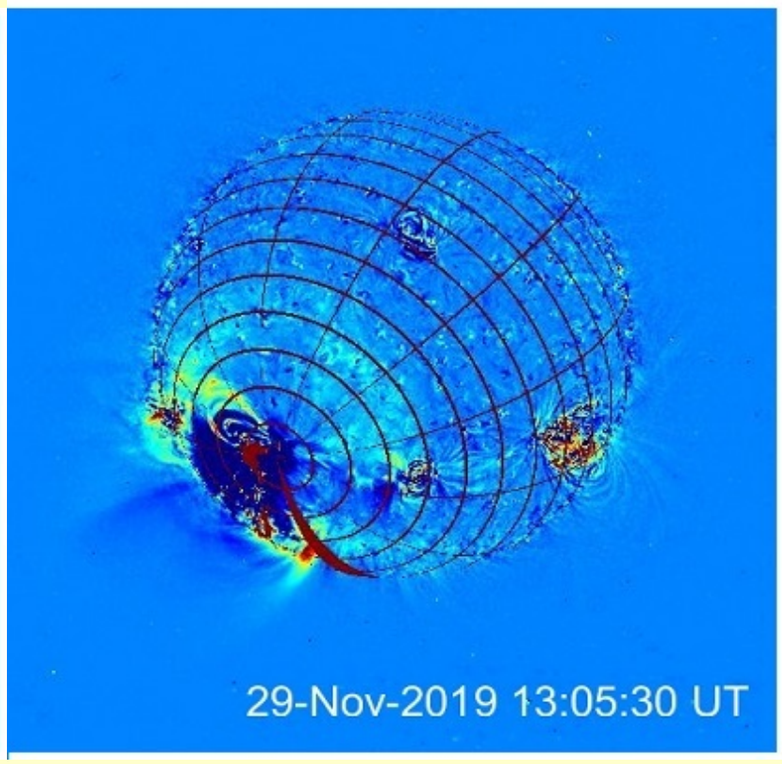
Appendix

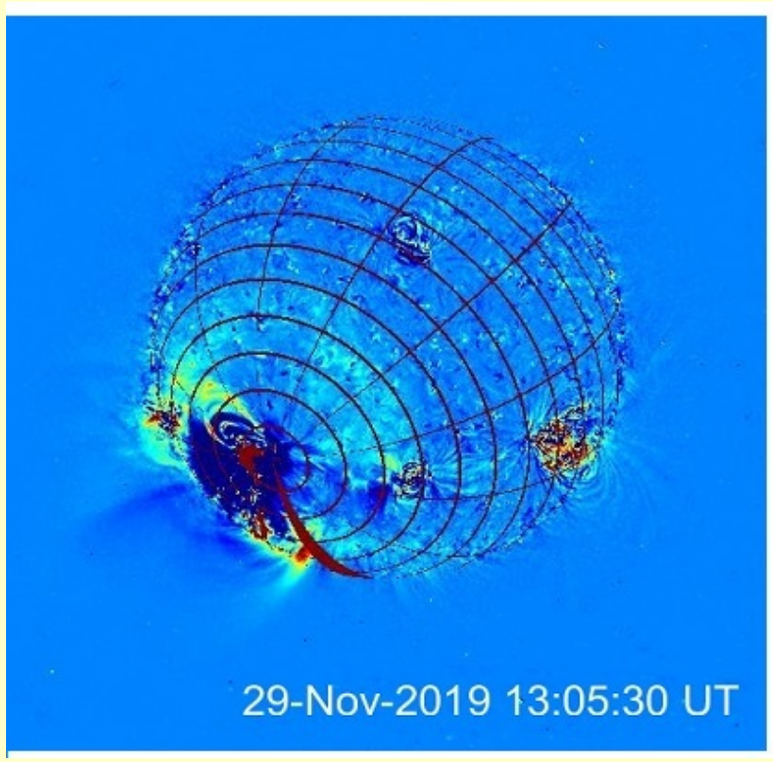
EIT waves

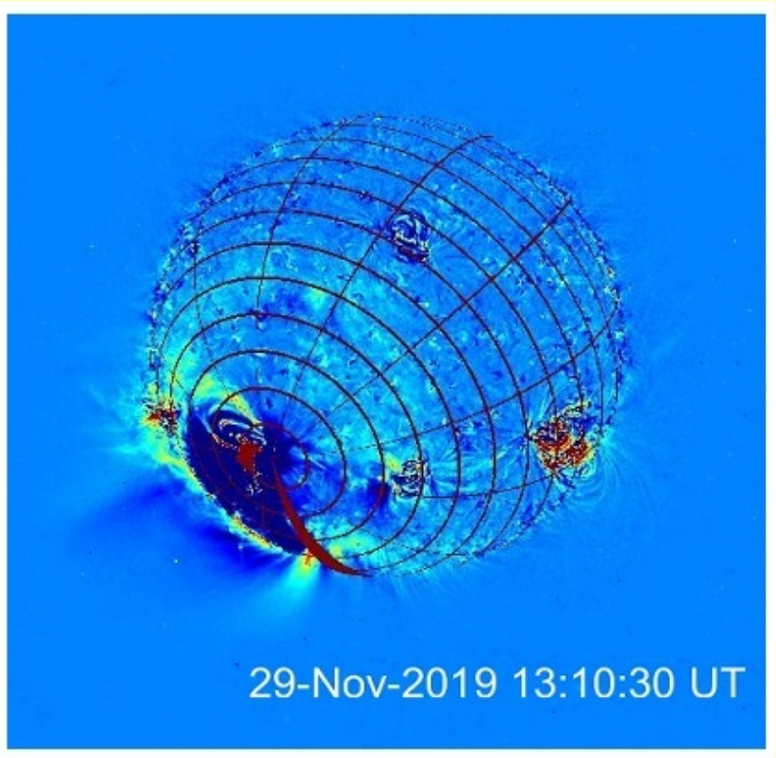
Image

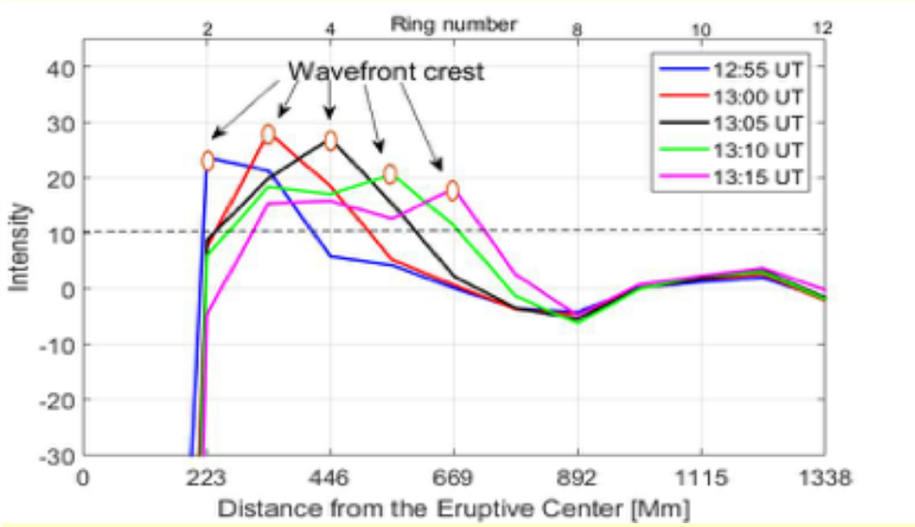




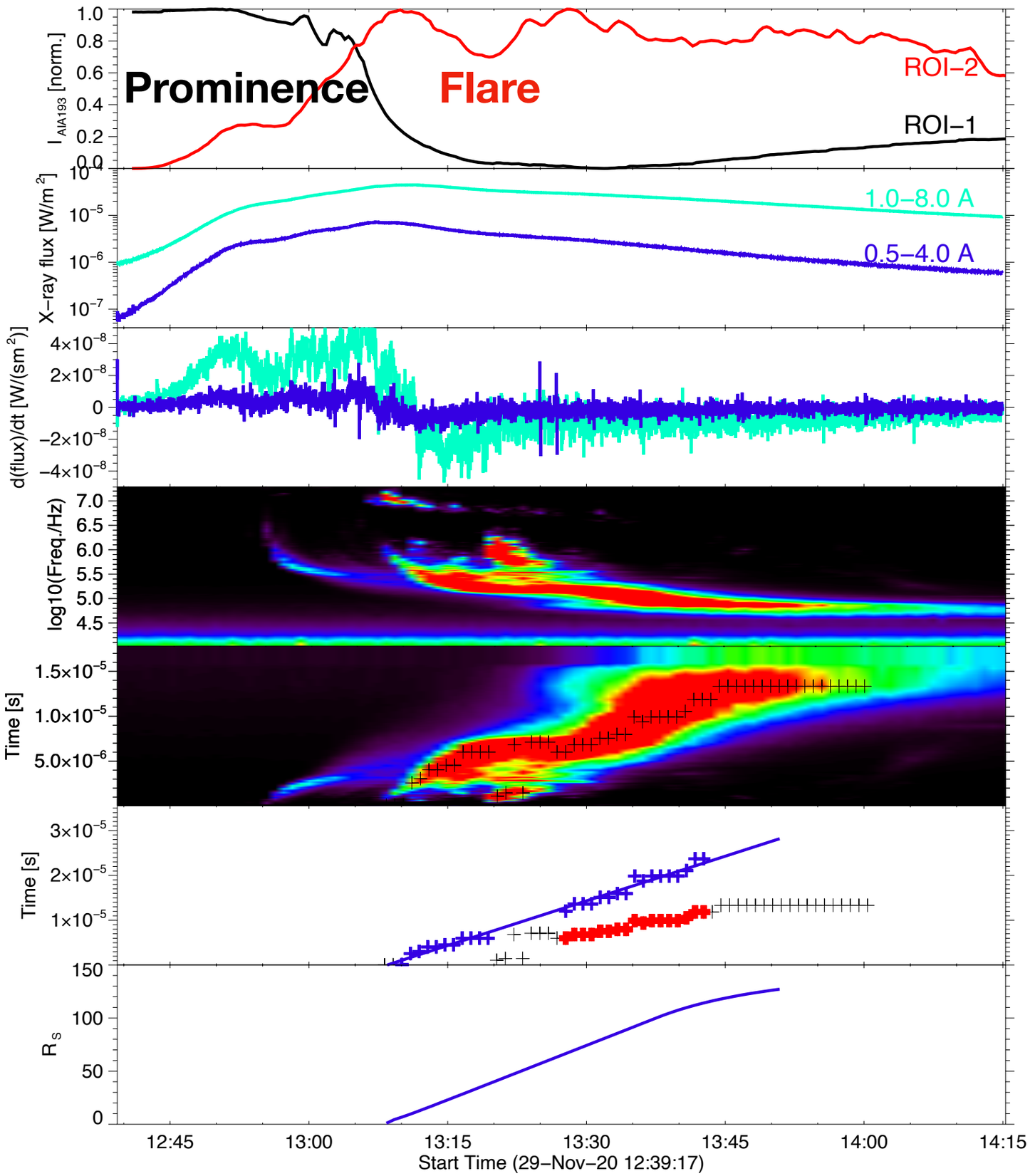








Radio-bursts



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EIT wave -CME

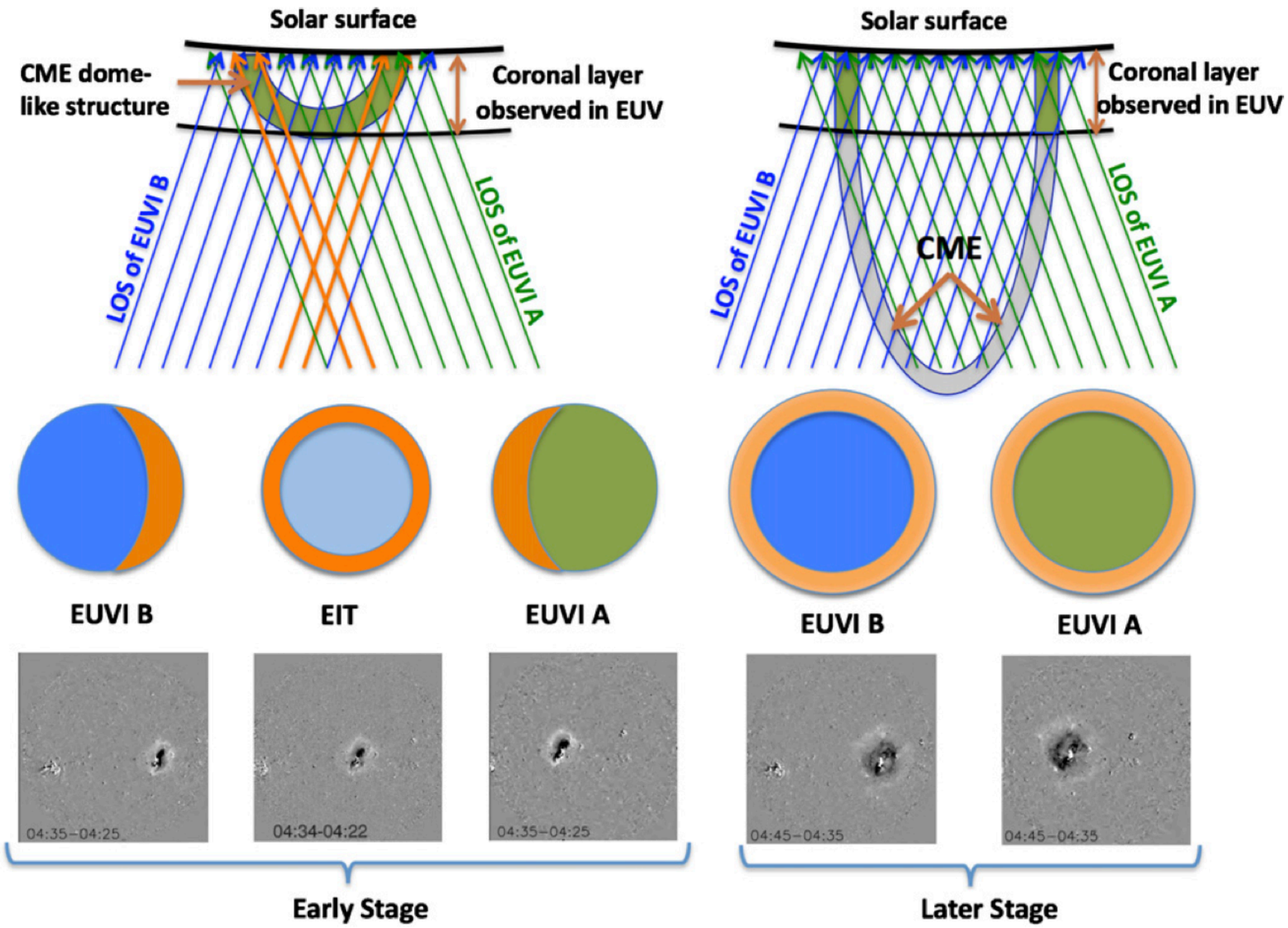

Figure 5. Schematic descriptions show how projection effects influence the observational result in EUV images during the early stage of the solar eruption compared to the later stage. The top two figures show the morphology of the CME and its associated coronal disturbance as well as the LOS from EUVI A and B. The space between the two black horizontal lines shows the layer of the solar atmosphere observed in EUV. The two sets of parallel vectors indicate the fields of view and LOS of EUVI A and B, respectively. The orange lines mark the region along the LOS where the column depth is thicker. The circles in the middle row show how observations can be influenced by projection effects. The regions of increased optical depth are indicated in orange. The bottom row displays the corresponding observational results.

Ma et al. (2009)