Blowout expansion of a coronal mass ejection and subsequent filament eruption

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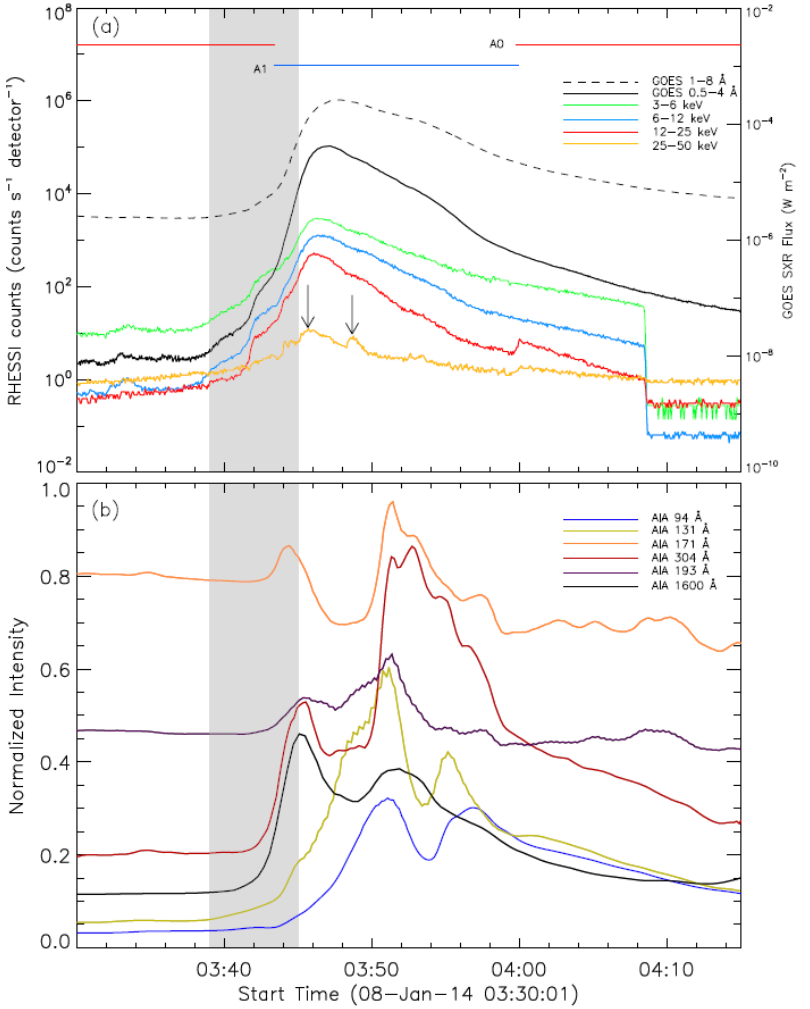
Aim

- To explore the origin of coronal mass ejection (CME) in low corona.
- To study its link with the underlying flux rope eruption together with flare emissions.

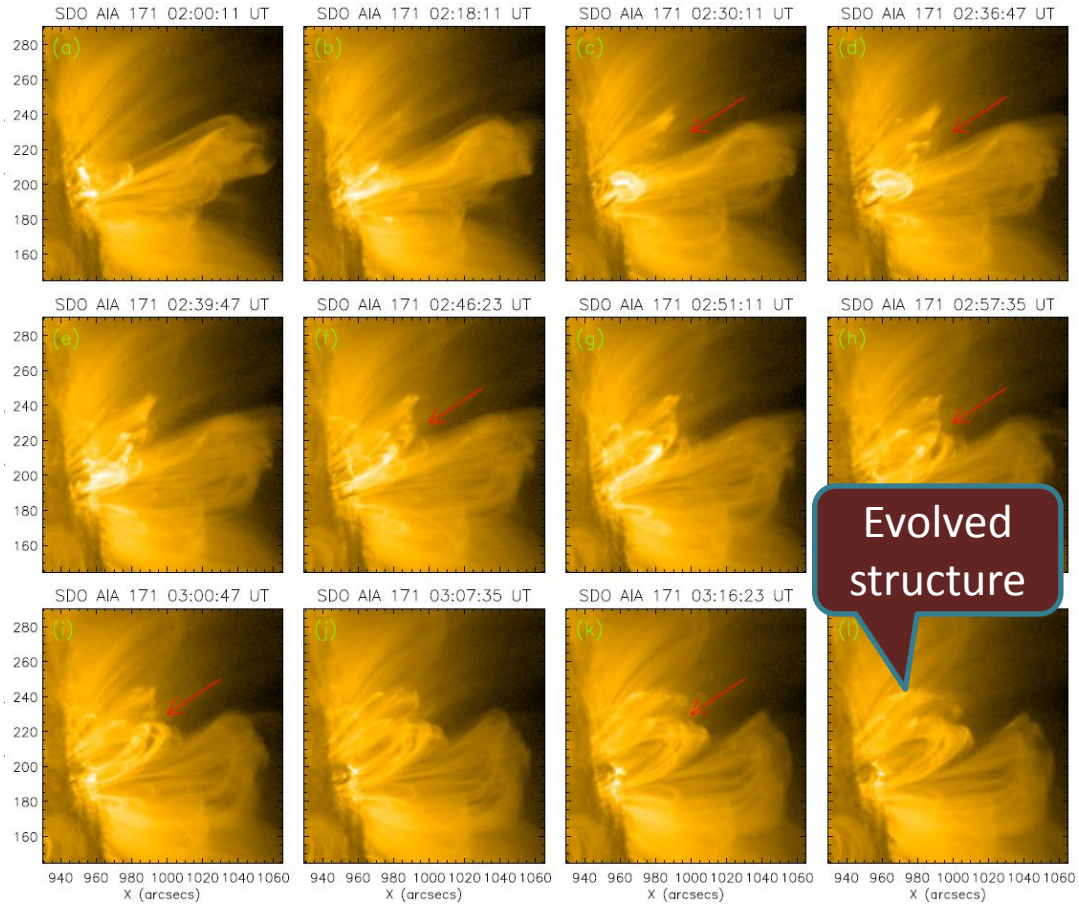
Observational Data

- Atmospheric Imaging Assembly (AIA) on board Solar Dynamics Observatory (SDO),
- Reuven Ramaty High Energy Solar Spectroscopic Imager (RHESSI),
- Hiraiso Radio Spectrograph (HiRAS).

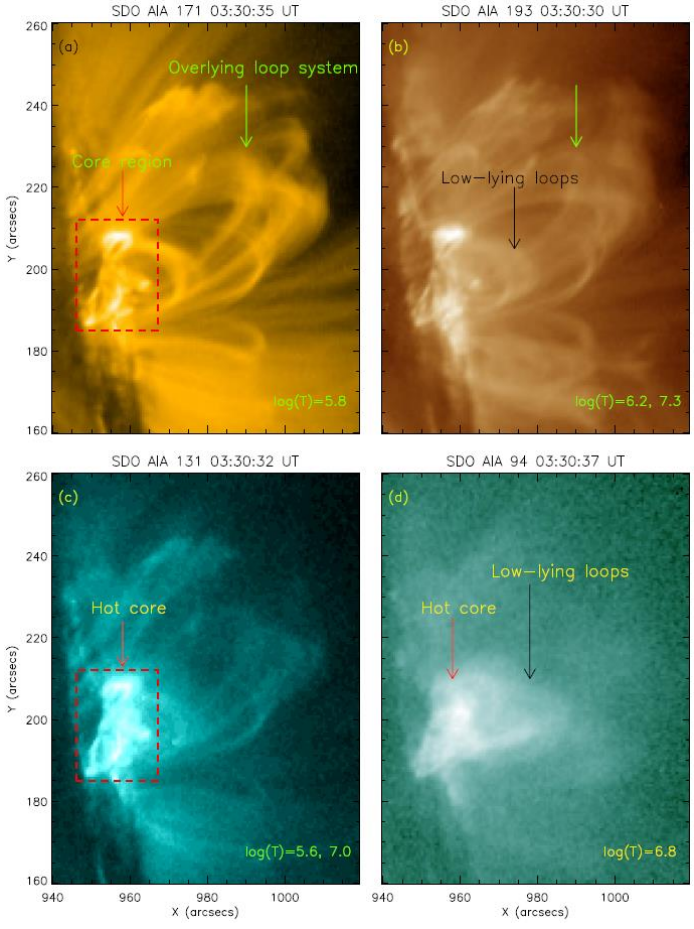


Temporal evolution: X-ray and EUV light Curves

Origin and evolution of pre-CME coronal arcade

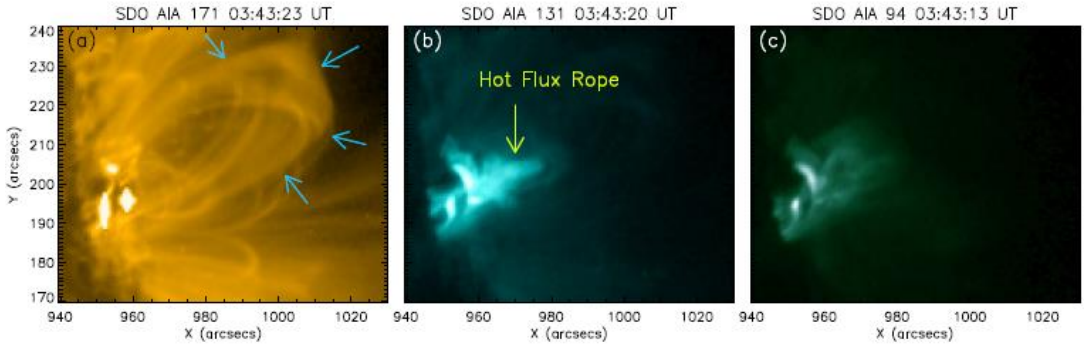


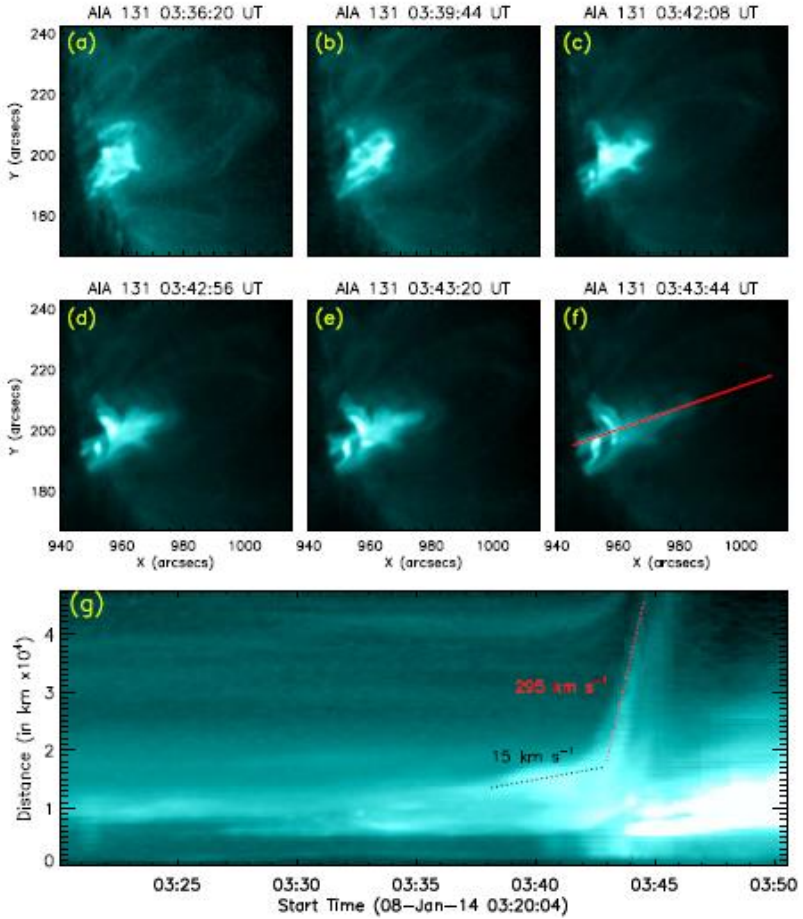
Multi-wavelength view of coronal loops



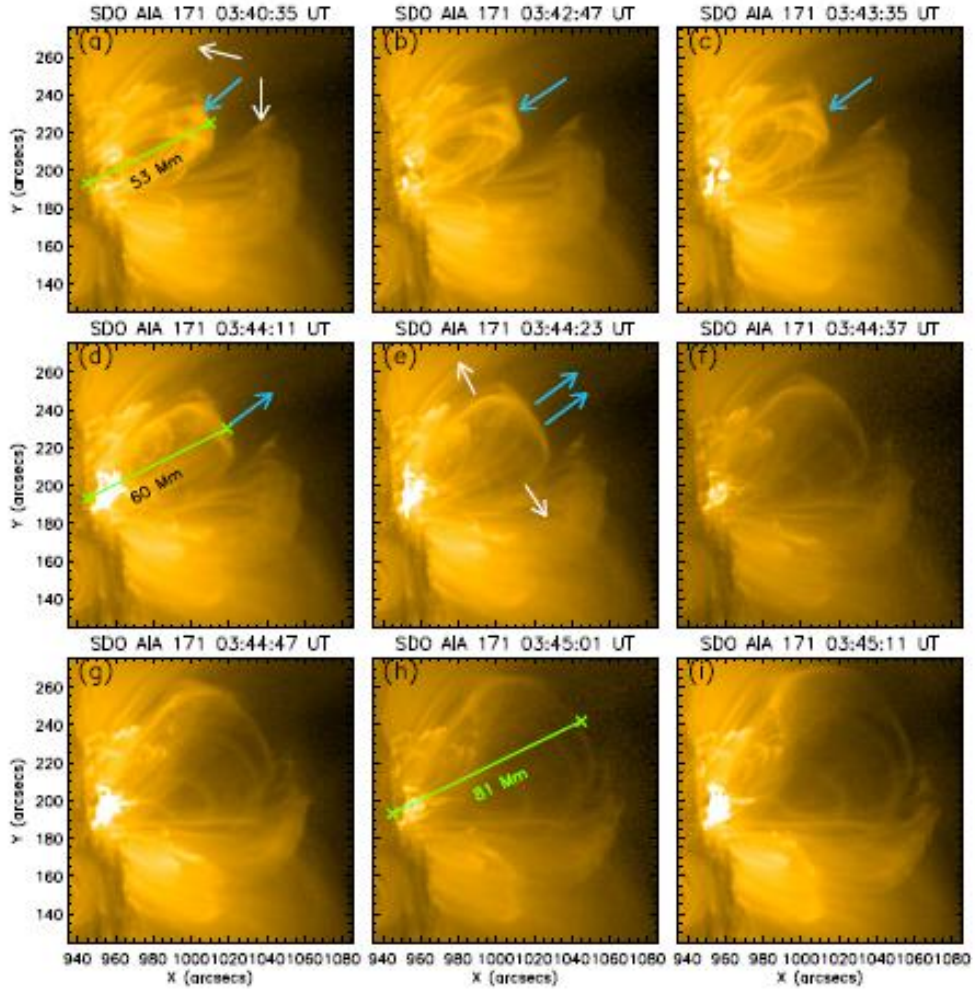
Existence and Eruption of hot flux rope

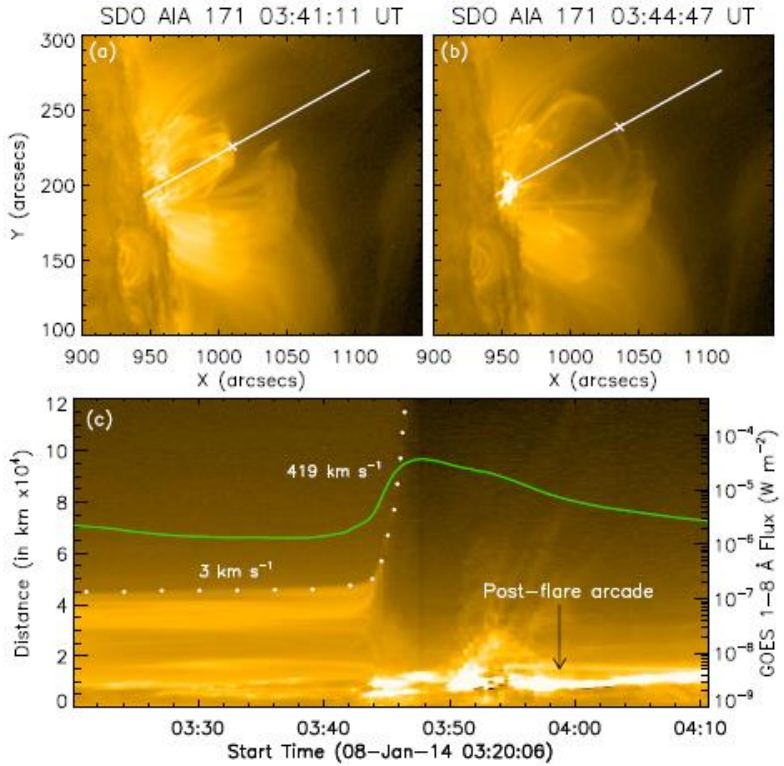
- ✓ Below the overlying coronal loops, there exists a hot coronal channel (i.e. flux rope) at the core region.
- ✓ Two phase eruption: (i) slow rise with speed ≈10 km/s, (ii) fast rise with speed ≈300 km/s; of the flux rope is observed.



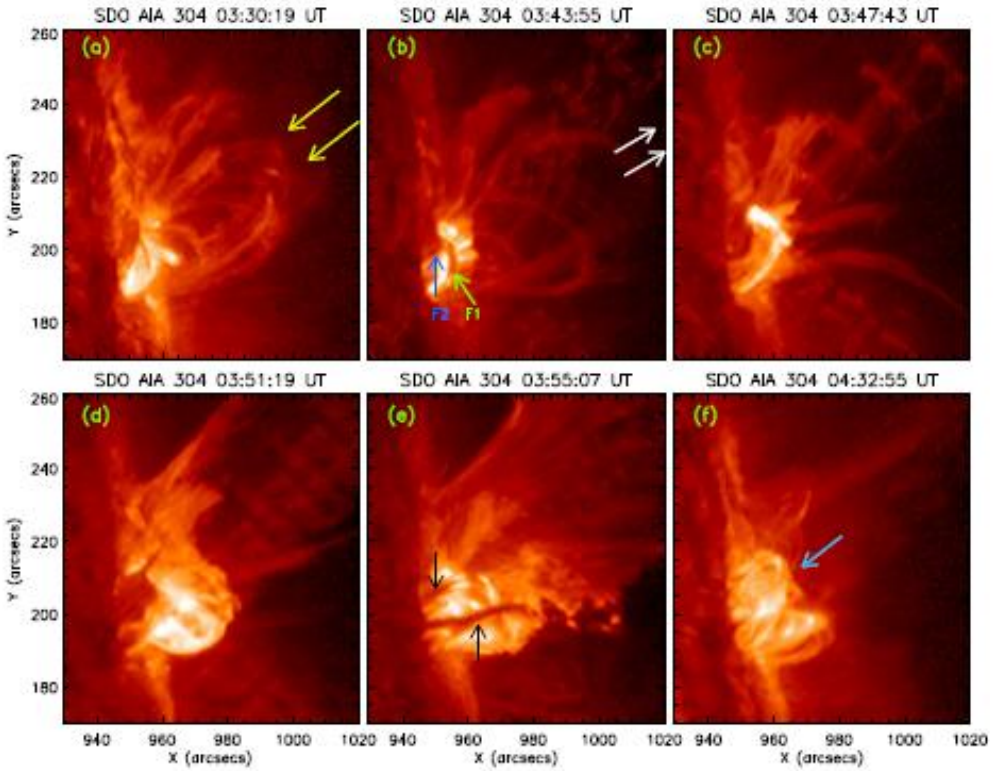


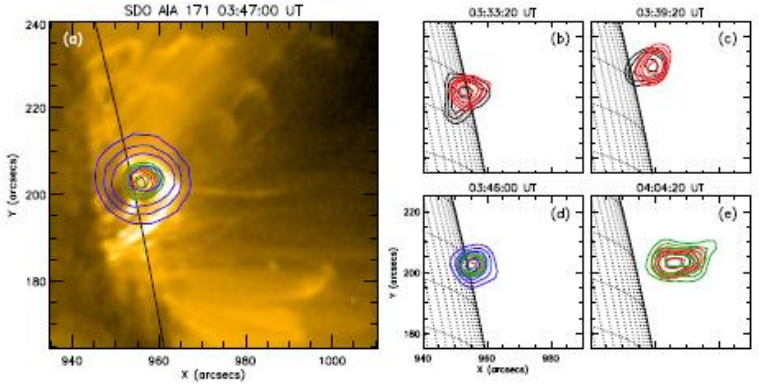
Arcade-to-Bubble evolution and subsequent blowout expansion



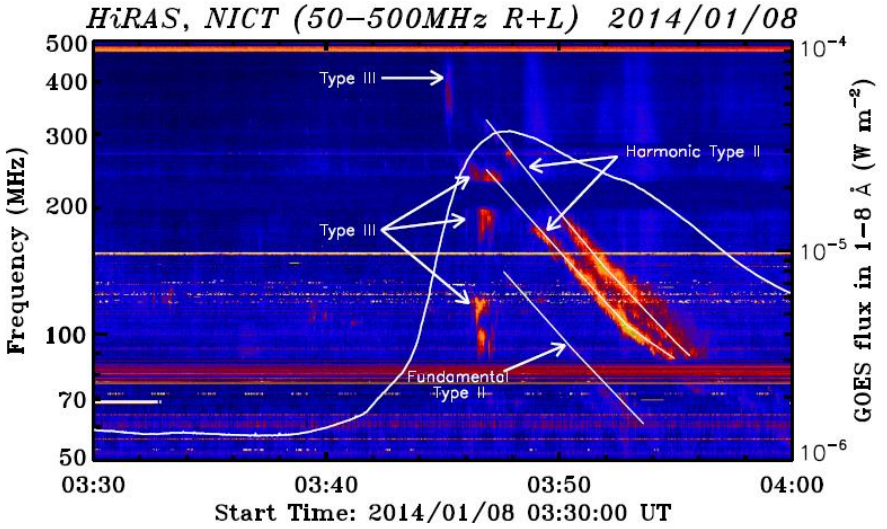


Filament eruption and an M-class flare





Black contours: 3-6 keV.; Red contours: RHESSI 6-12 keV
Green contours: 12-25 keV; Blue contours: 25-50 keV



Summary

- Observations from the AIA 171 Å images reveal the origin of pre-CME arcade ≈1 hour prior to the eruptive events. Multi-wavelength view of the pre-CME coronal arcade suggests its dense and hot characteristics.
- Hot AIA 131 and 94 Å channels exhibit the presence of hot flux rope at the core region. The eruption of the flux rope contribute toward the CME-bubble formation and its subsequent blowout expansion.
- A temporal correlation between the blowout expansion of the CME and enhanced X-ray fluxes suggests a feedback association between kinematical evolution of CME and impulsive phase of the flare.
- The blowout expansion of CME is accompanied with gradually varying EUV and X-ray emissions from the hot core and multiple type III radio bursts, indicating the magnetic reconnection as a possible triggering mechanism for CME.
- With the impulsive phase, the activation and subsequent eruption of two successive filaments take place. At the source region of the filament, compact hard X-ray sources of energy up to ≈50 keV are observed.

Thanks…