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Temporal and spatial relationship of flare signatures and the coronal magnetic field

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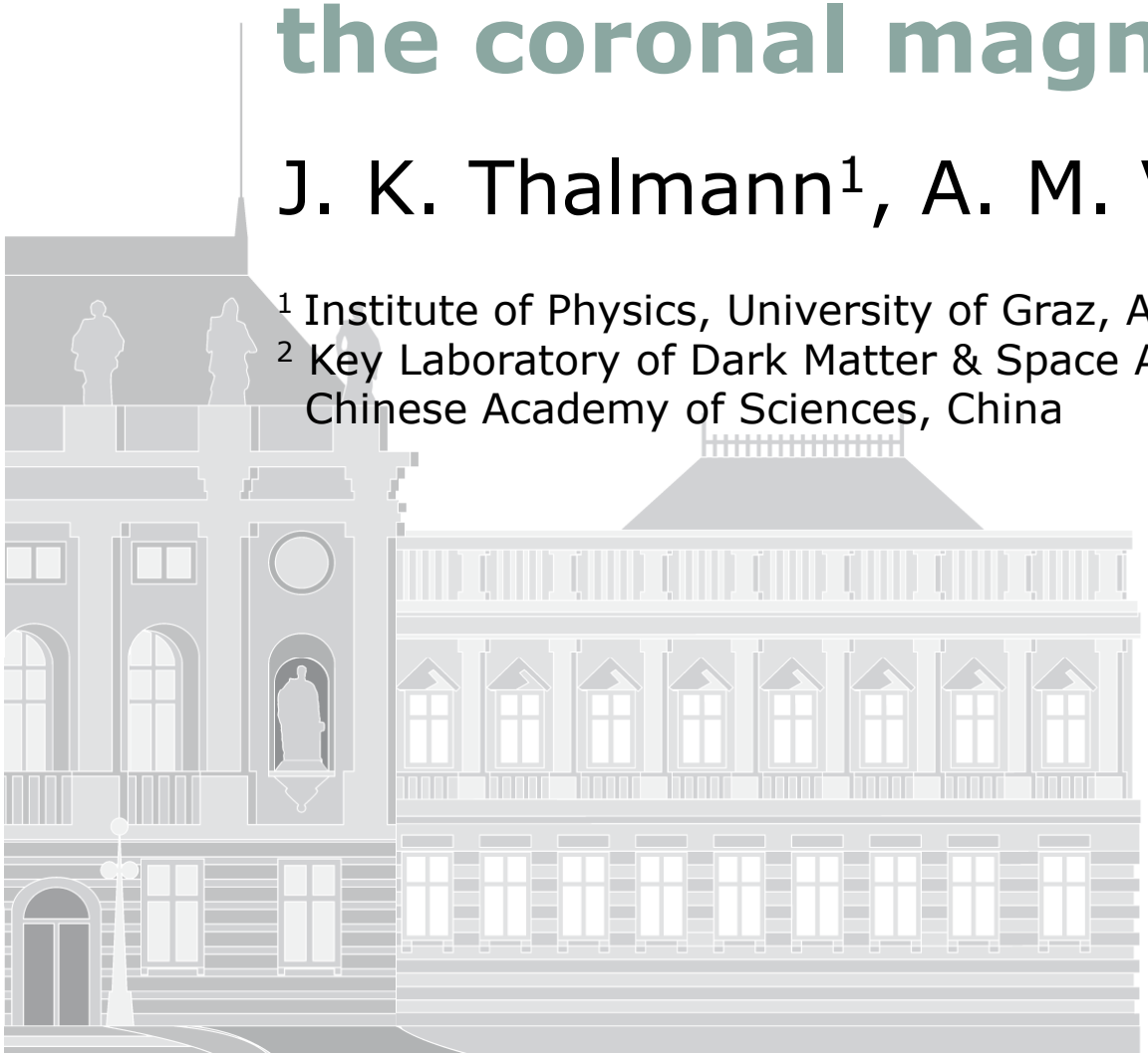
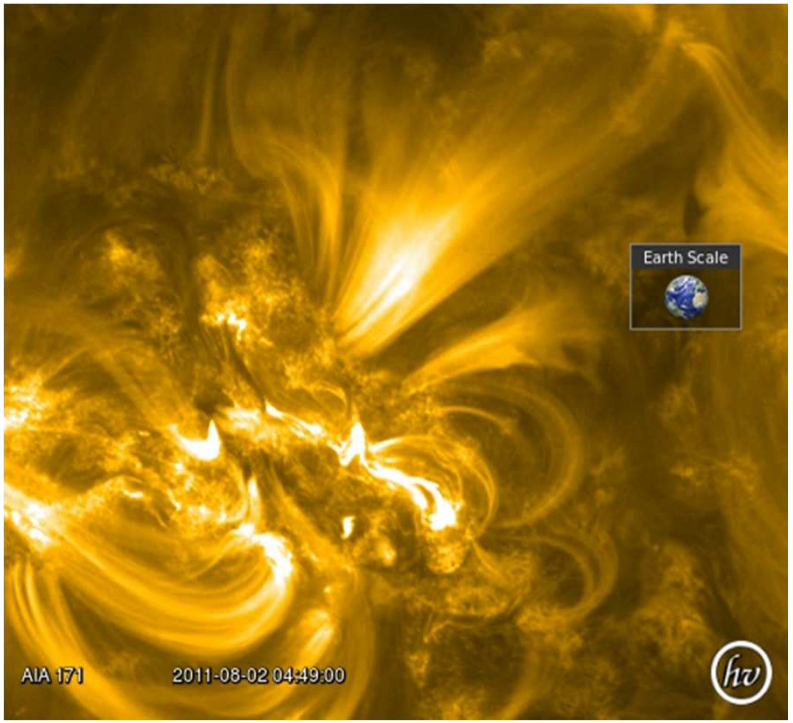


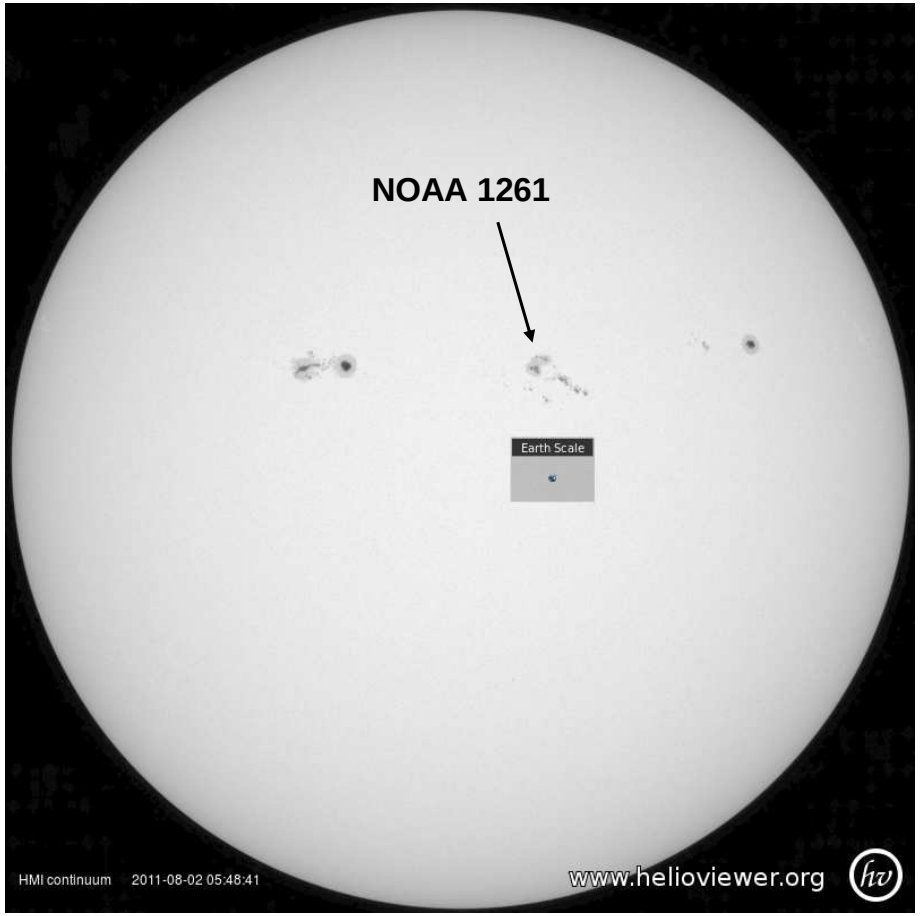
FWF Der Wissenschaftsfonds.

Event overview – The M(onkey) 1.6 flare

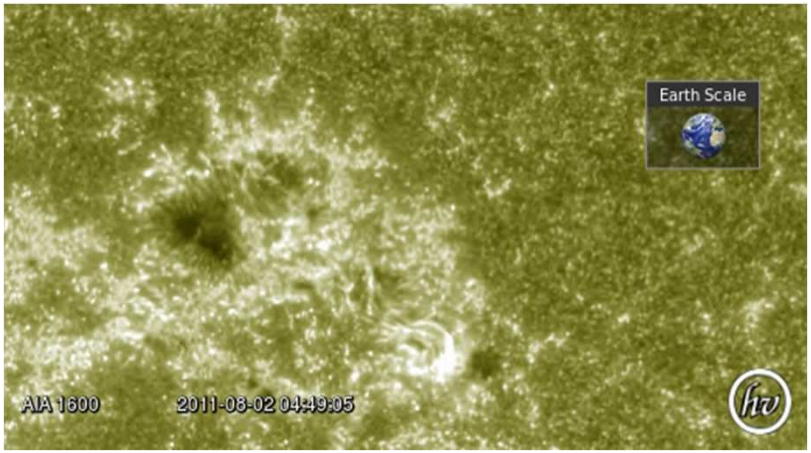
coronal emission (AIA 171 Å)



photospheric continuum emission (HMI 6173 Å)



photosphere & transition region emission (AIA 1600 Å)



Event overview – The M(onkey) 1.6 flare

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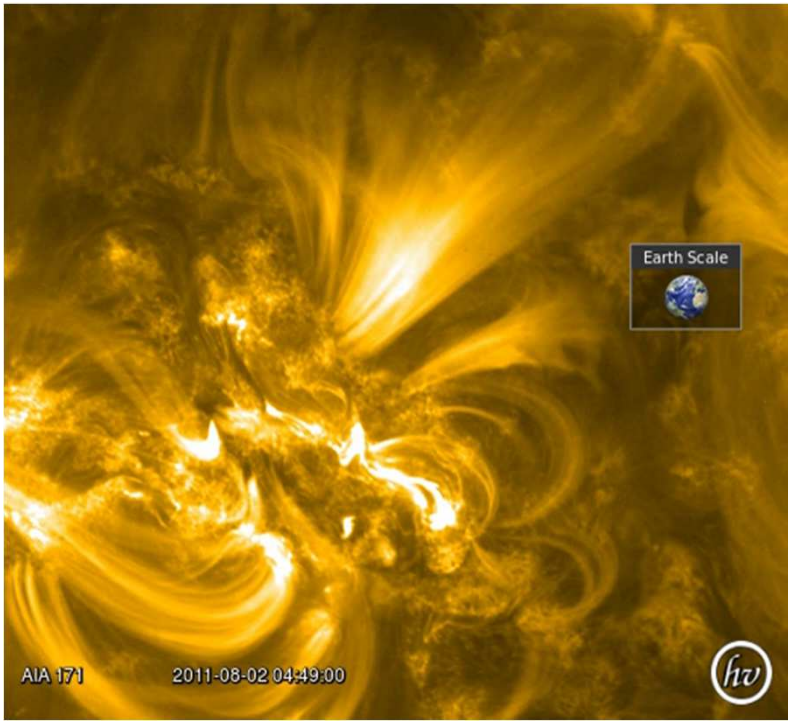

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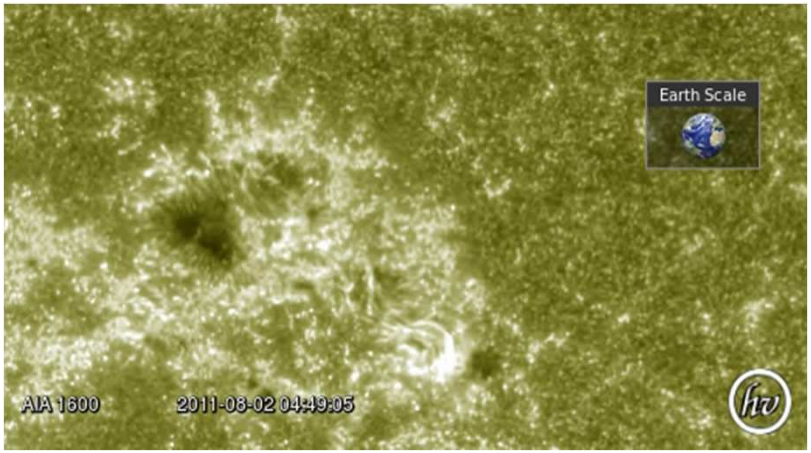
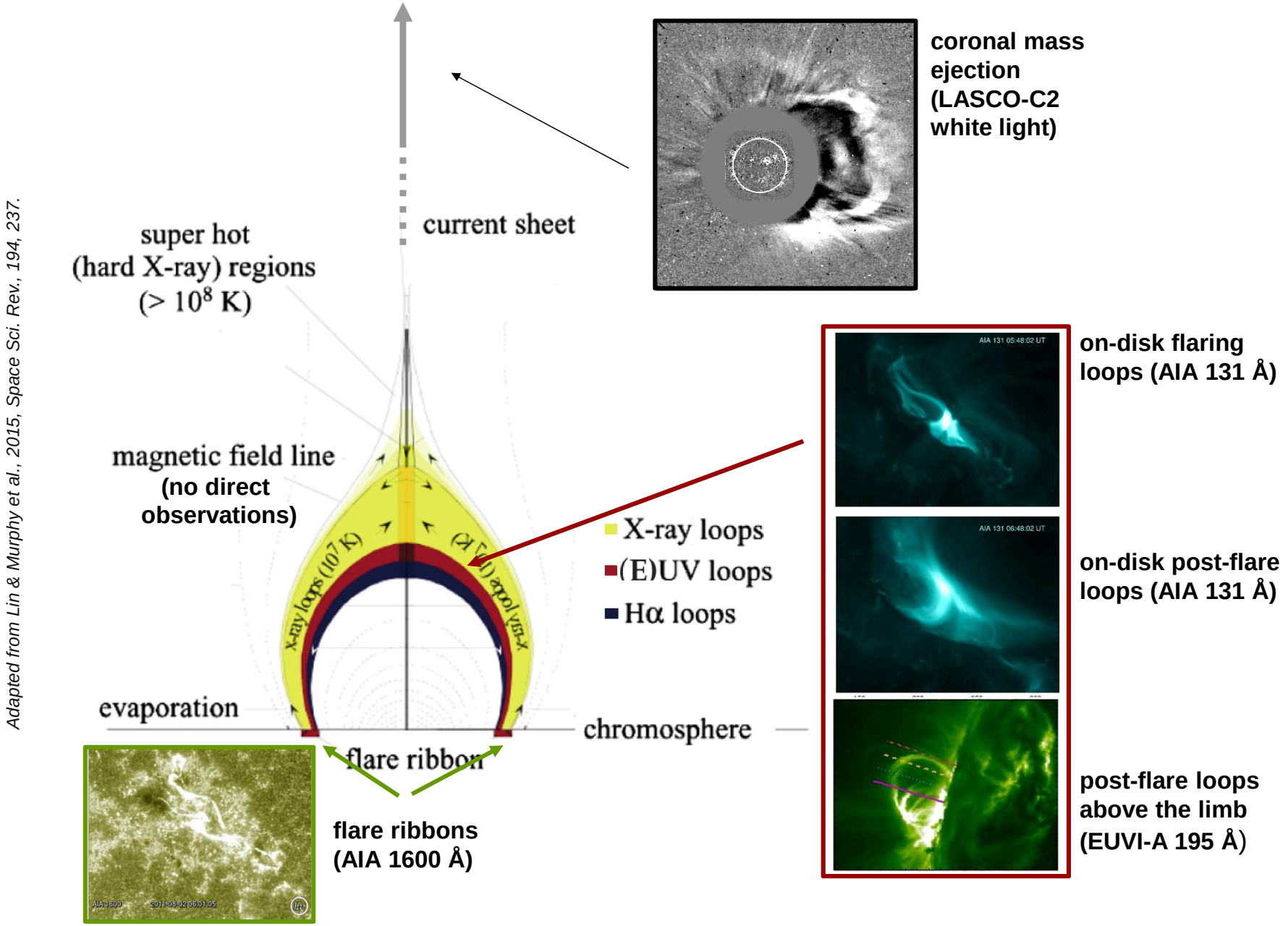
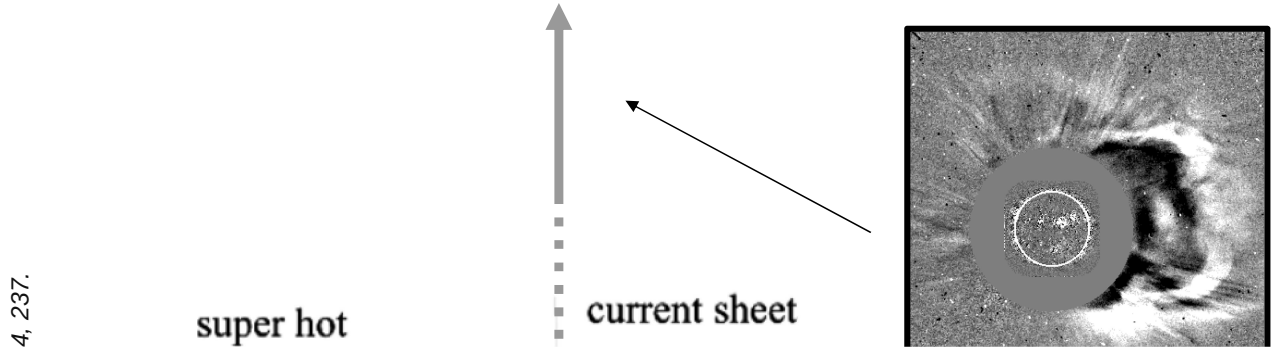


Event overview – The M(onkey) 1.6 flare



Event overview – The M(onkey) 1.6 flare



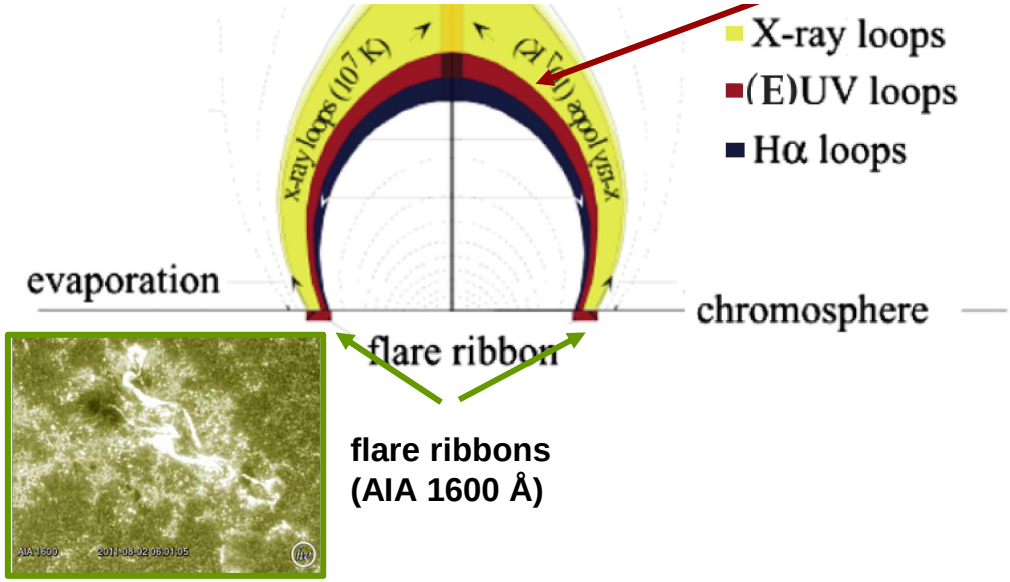
coronal mass ejection (LASCO-C2 white light)

Motivation:

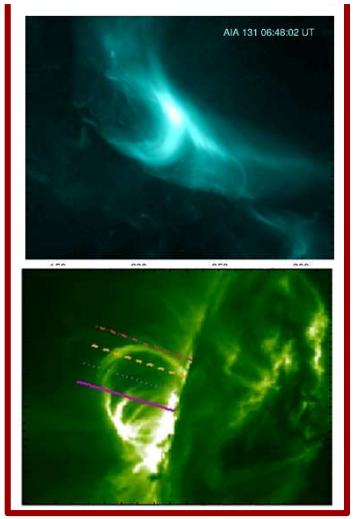
How does the timing and location of the different flare-related observations compare?

What can we say about the involved coronal magnetic field?

Adapted from Lin & Murphy



flare ribbons (AIA 1600 Å)

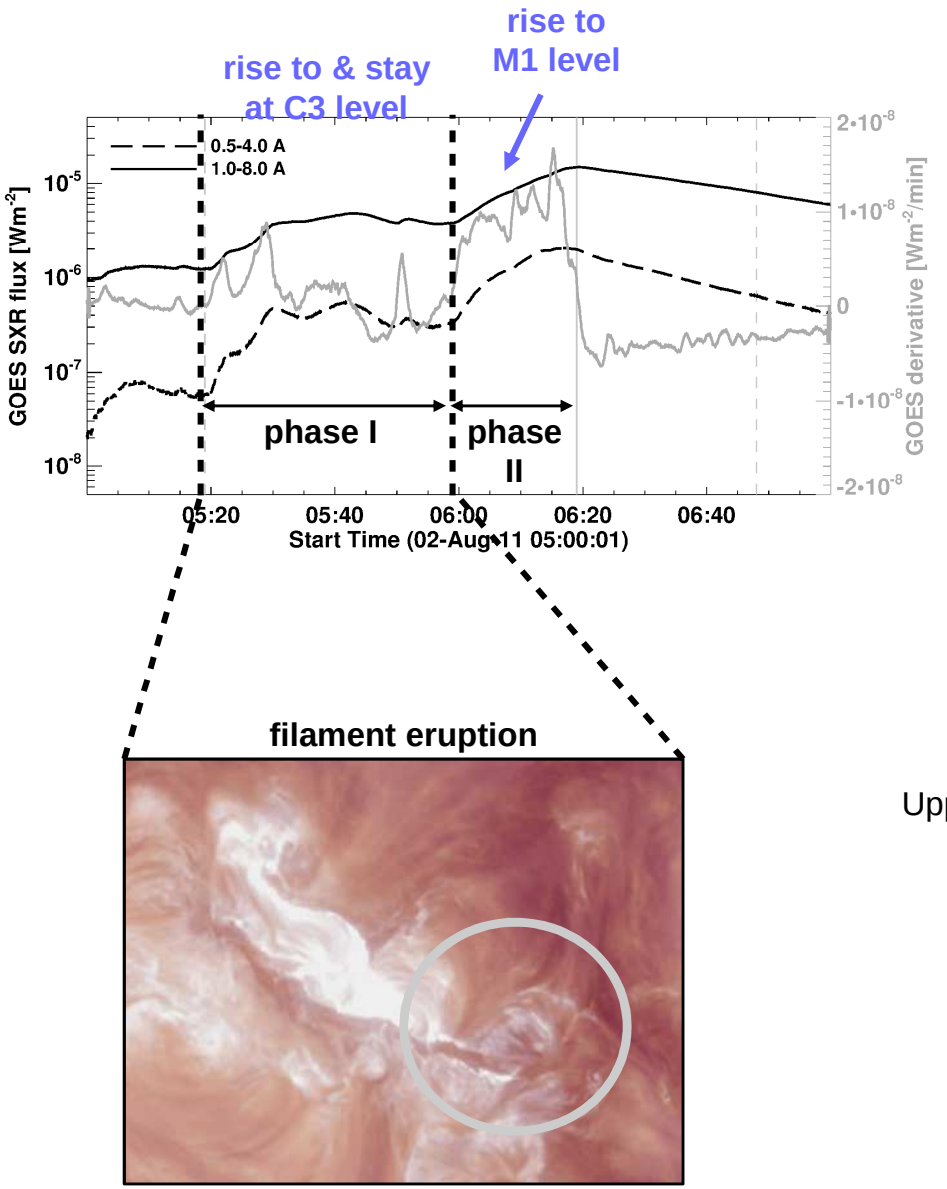


on-disk post-flare loops (AIA 131 Å)

post-flare loops above the limb (EUVI-A 195 Å)

Event overview – The M(onkey) 1.6 flare

Coronal emission (AIA 171 Å)

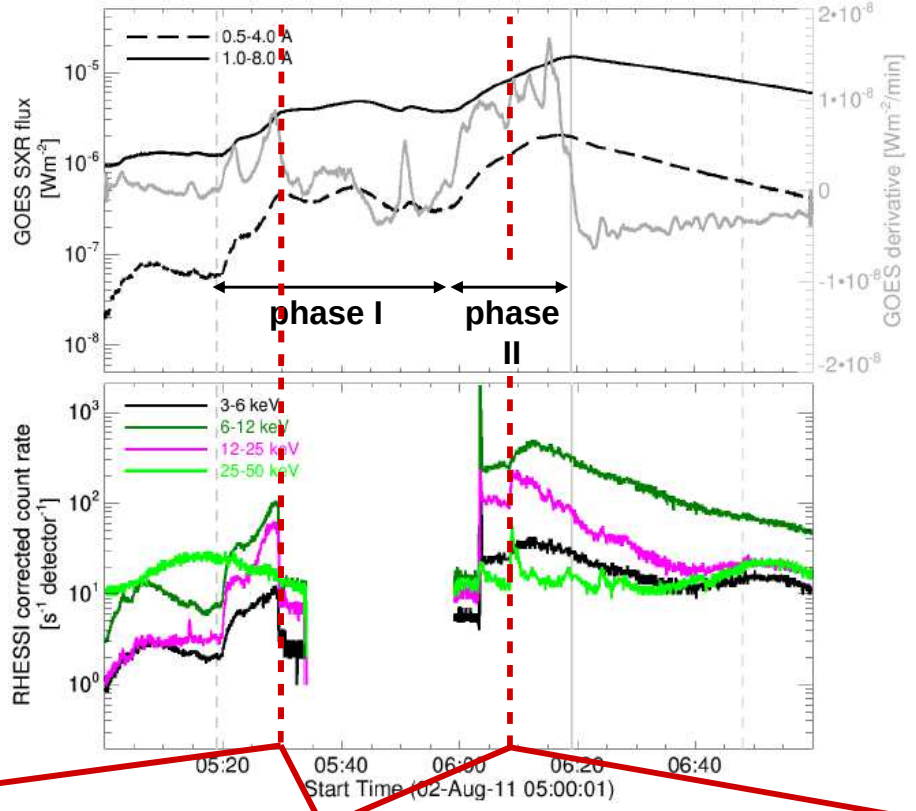


Upper photosphere & transition region emission (AIA 1600 Å)

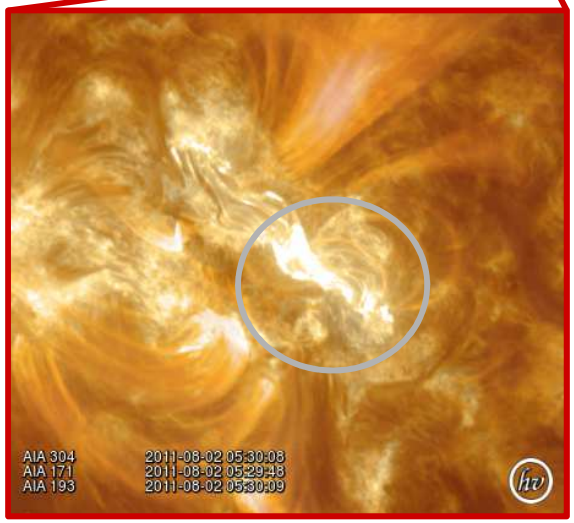
Temporal relation of flare-related EUV & X-ray emission

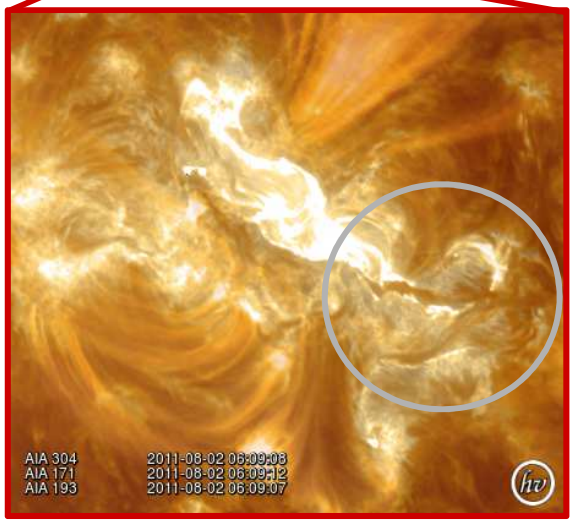
GOES SXR flux (0.5–8 Å)
GOES 1–8 Å derivative

RHESSI count rates
–– non-thermal
⚍ thermal



initiation of the flare process in a low-lying filament channel



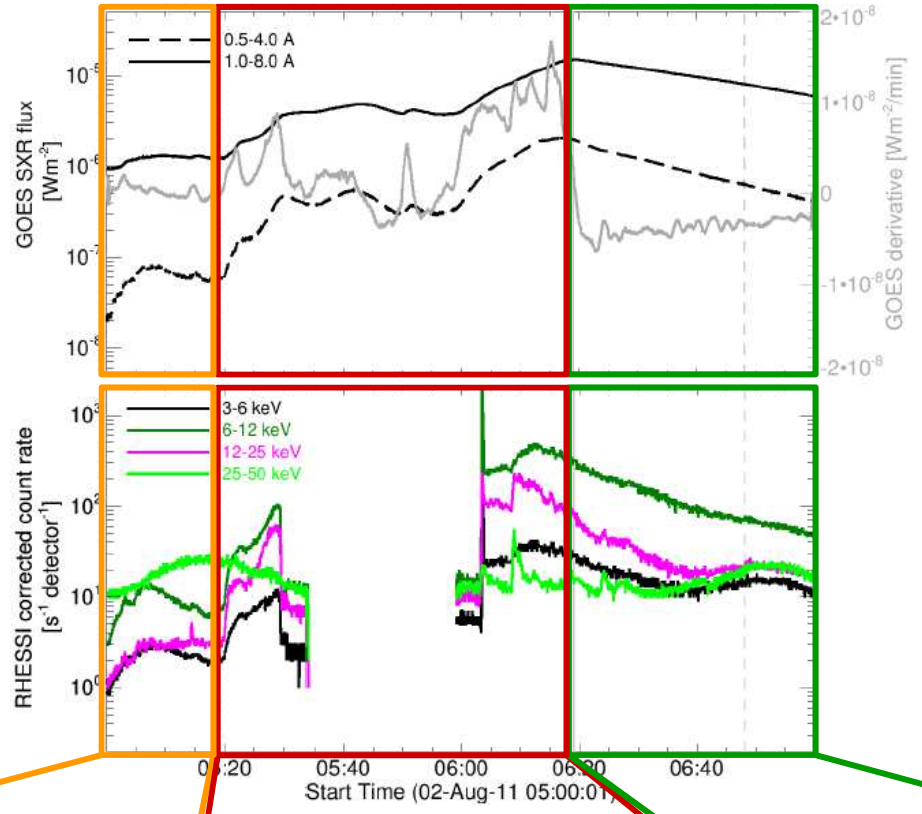


partial filament eruption

Spatial relation of flare-related EUV & X-ray emission

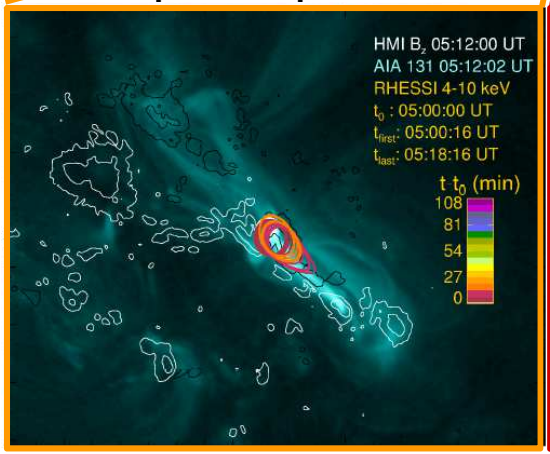
GOES SXR flux (0.5–8 Å)
GOES 1–8 Å derivative

RHESSI count rates
–– non-thermal
⚍ thermal

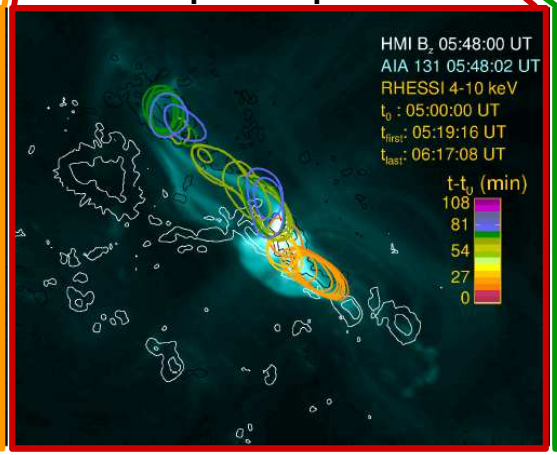


thermal X-ray sources (RHESSI 4-10 keV) above coronal EUV emission (AIA 131 Å) + HMI Bz (contours)

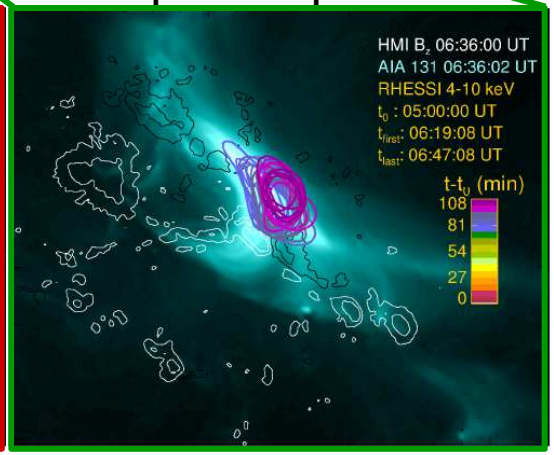
pre-flare phase



impulsive phase

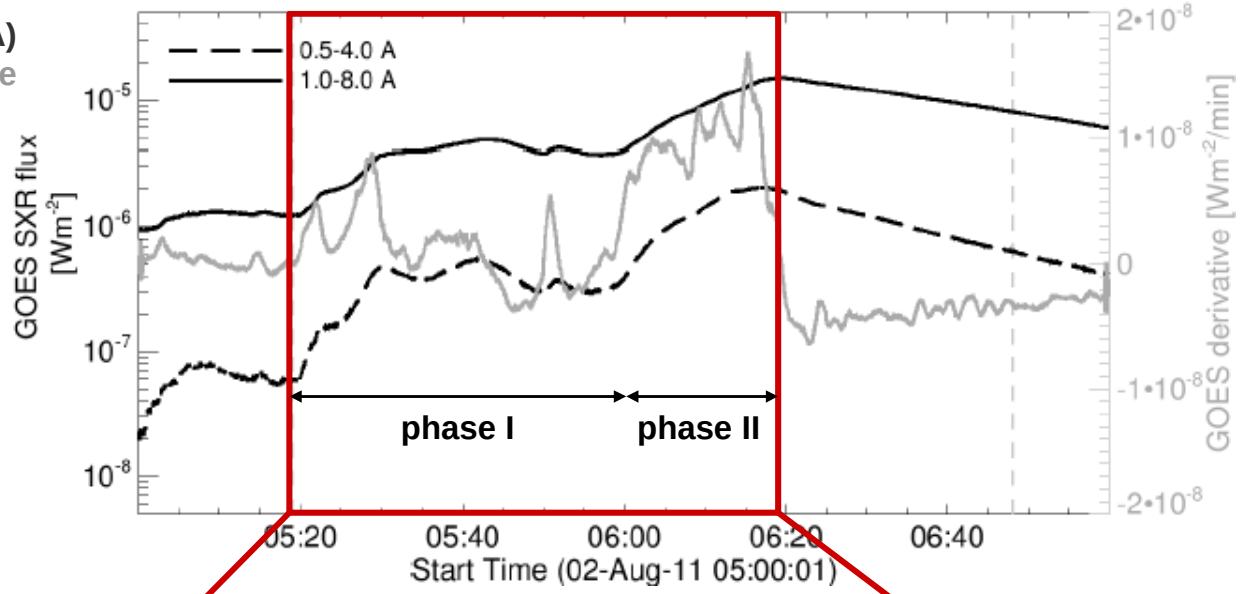


post-flare phase

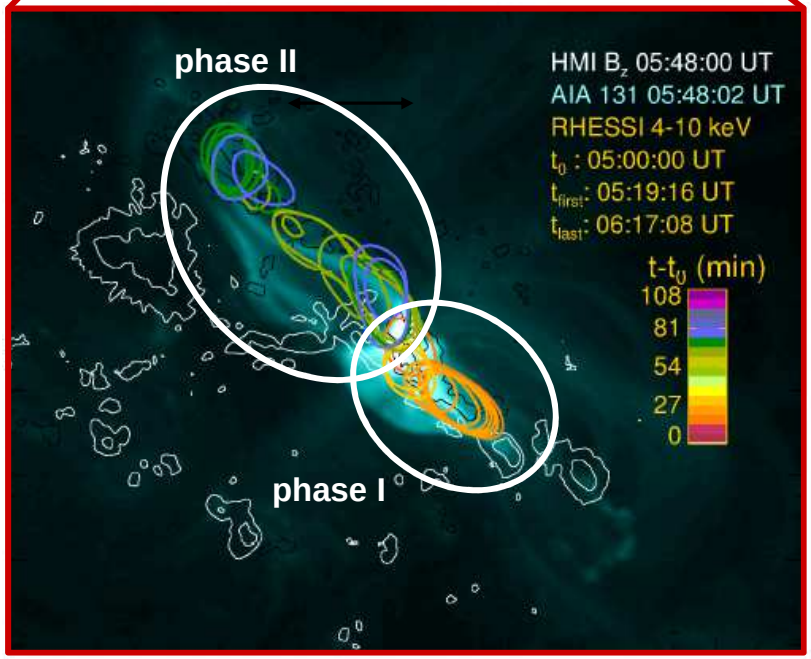


Spatial relation of flare-related X-ray & EUV emission

GOES SXR flux (0.5–8 Å)
GOES 1–8 Å derivative

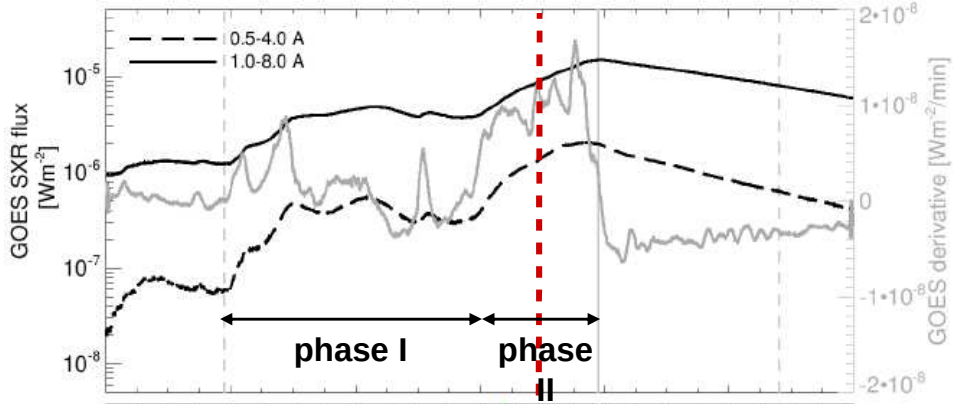


thermal X-ray sources (RHESSI 4-10 keV) above coronal EUV emission (AIA 131 Å) + HMI Bz (contours)

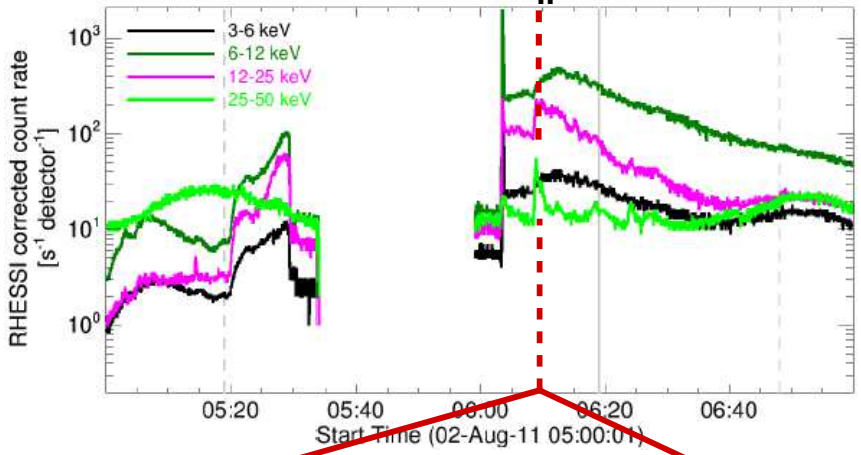


Spatial relation of flare-related X-ray & EUV emission

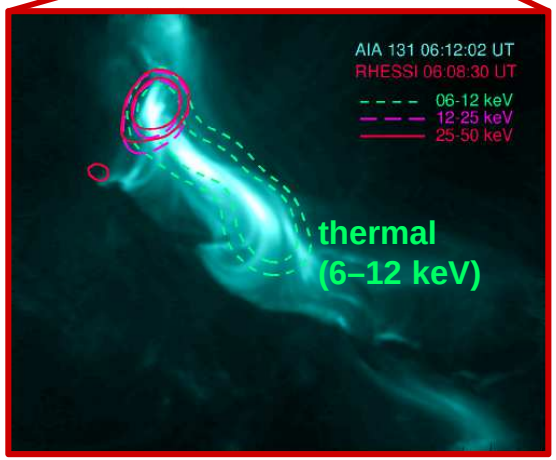
GOES SXR flux (0.5–8 Å)
GOES 1–8 Å derivative



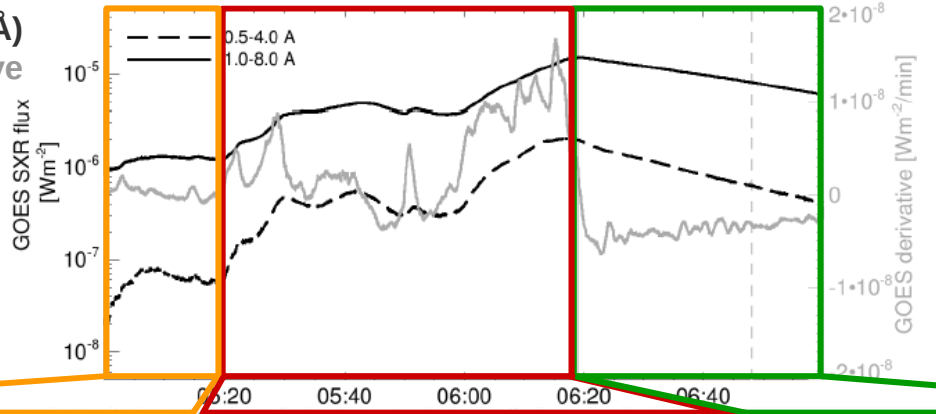
RHESSI count rates
–– non-thermal
⚌ thermal



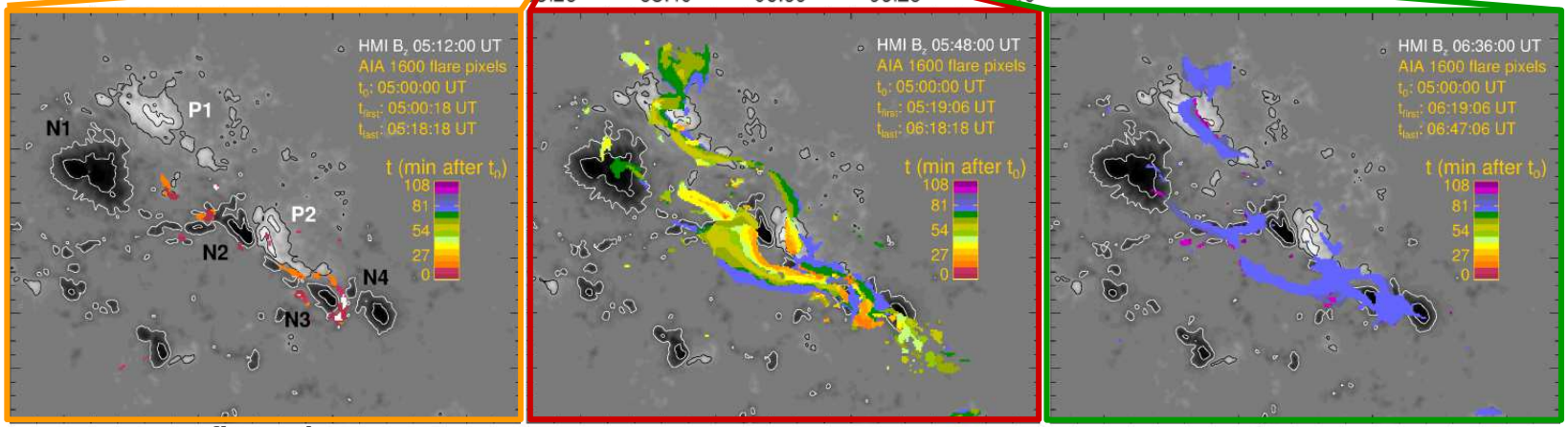
non-thermal X-ray sources (RHESSI 12–25 and 25–50 keV) above coronal EUV emission (AIA 131 Å)



Spatial relation of flare-related UV & X-ray emission

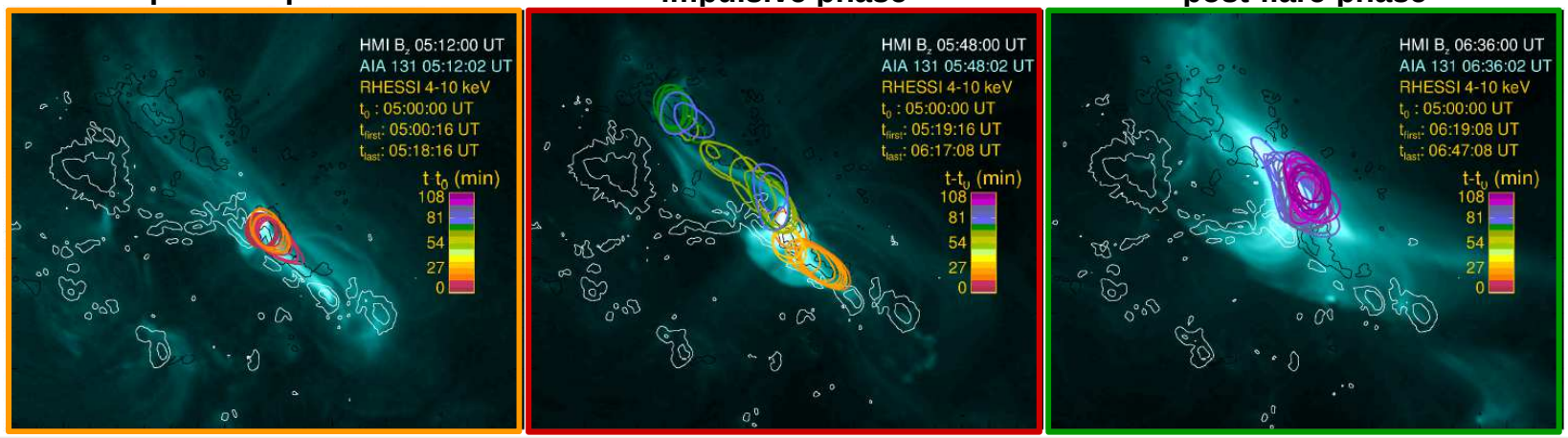


flare kernels/ribons (AIA 1600 Å) above HMI Bz



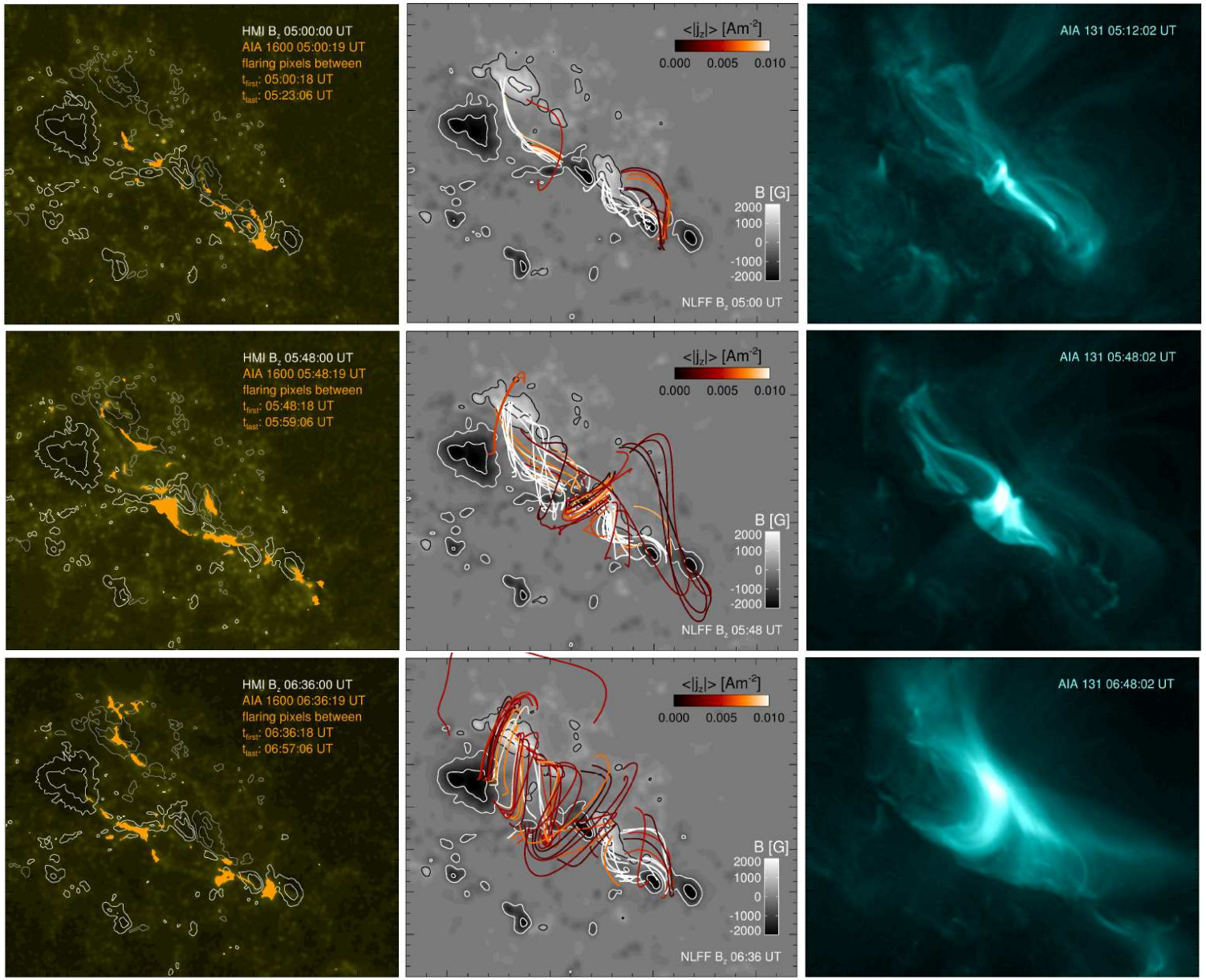
pre-flare phase **impulsive phase** **post-flare phase**

thermal X-ray sources (RHESSI 4-10 keV) above coronal EUV emission (AIA 131) + HMI Bz (contours)



Relation of flare-related (E)UV emission & magnetic field

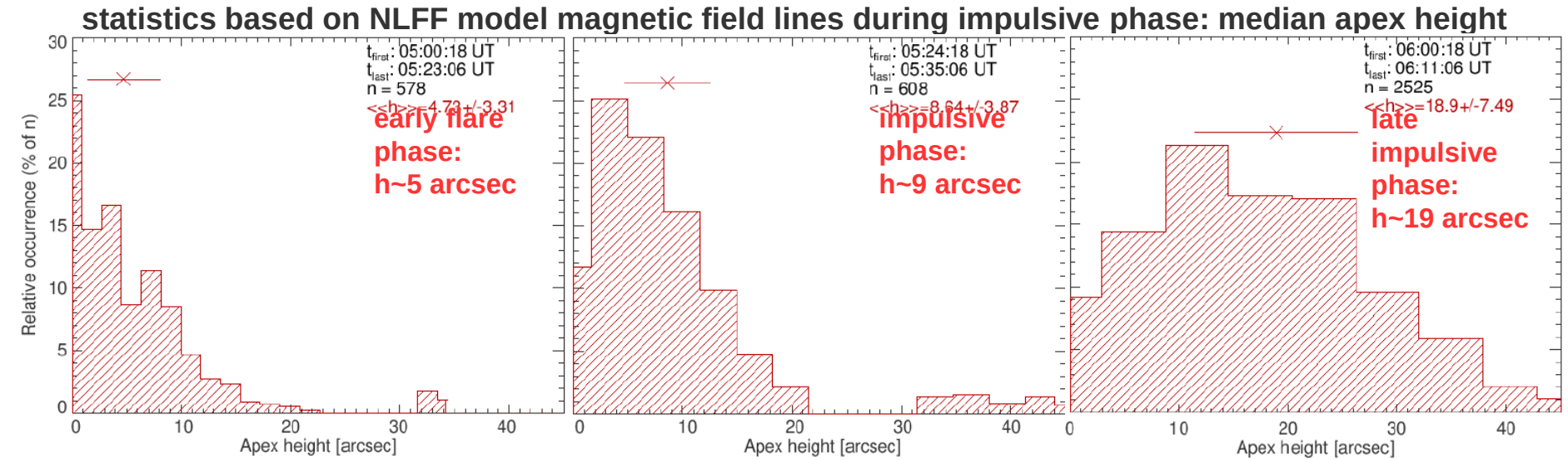
flare pixels (12-minute intervals) above AIA 1600 Å + HMI Bz (contours)

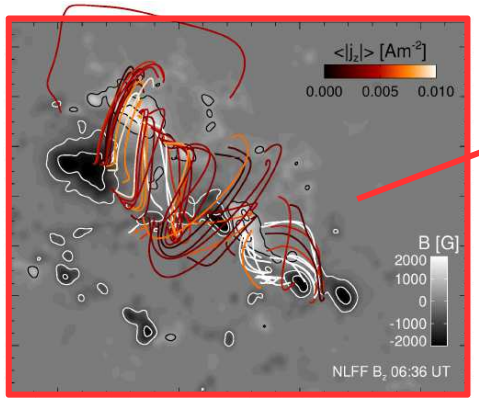


coronal EUV emission (AIA 131 Å at end of 12-min intervals)

NLFF (*Wiegelmann & Inhester, 2010, A&A, 516, A107*) model field lines (color code: mean vertical current density at footpoints) above HMI Bz

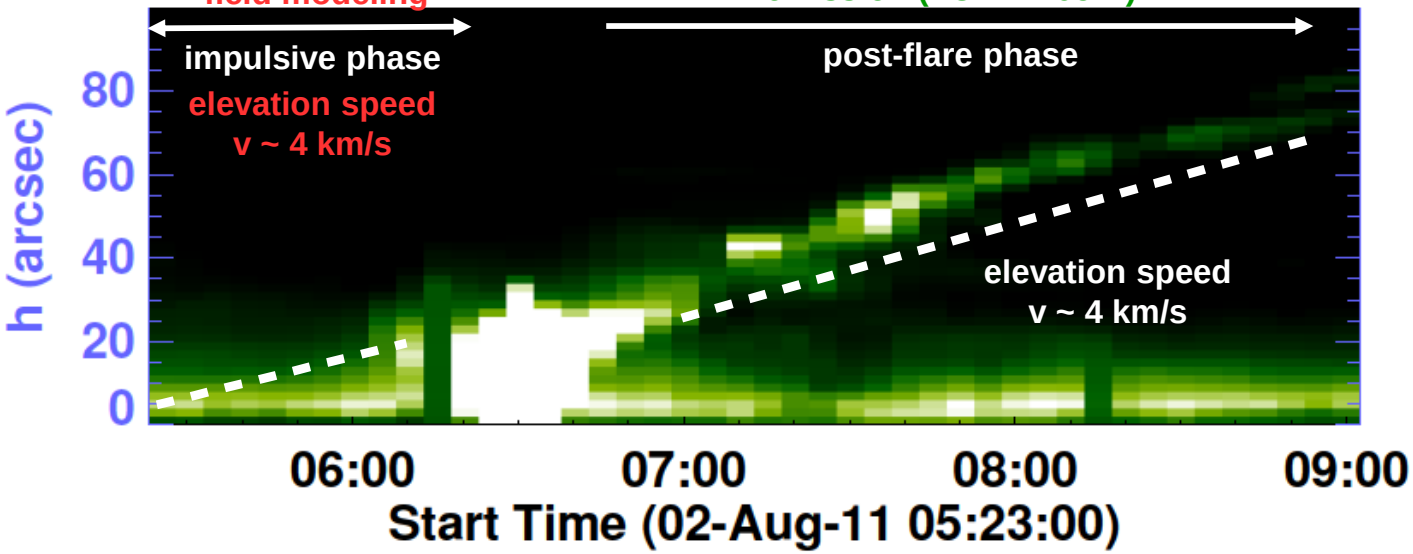
Approximate coronal height of reconnection region



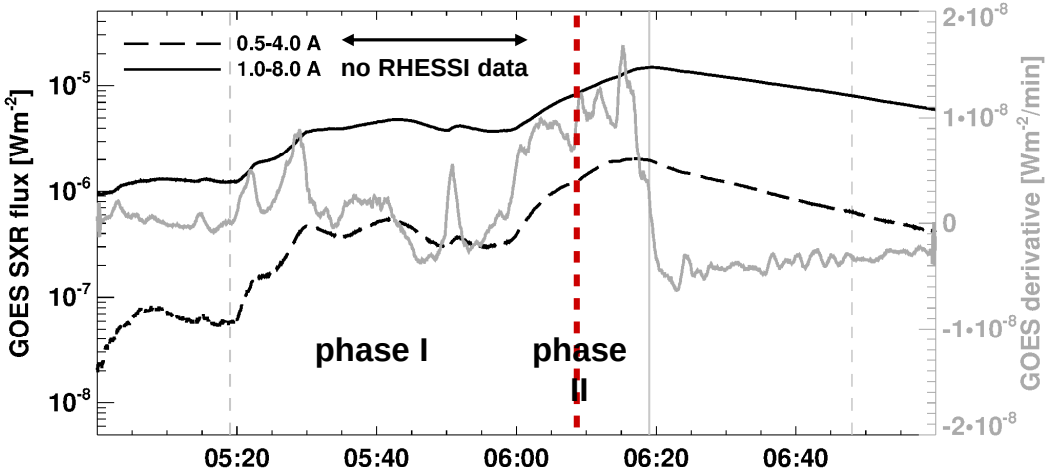


approximate altitude of coronal reconnection site derived from magnetic field modeling

derived from coronal EUV post-flare loop emission (EUV-A 195 Å)



Summary *(Thalmann, Su & Veronig, 2016, ApJ, accepted)*

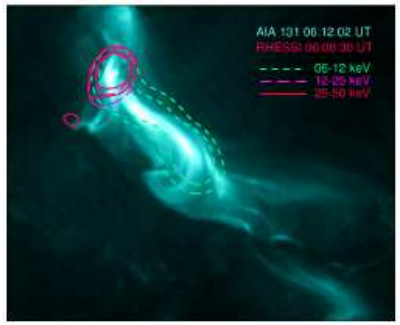


phase I

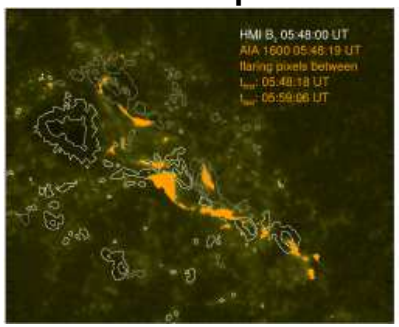
initiation of flaring process & partial filament eruption

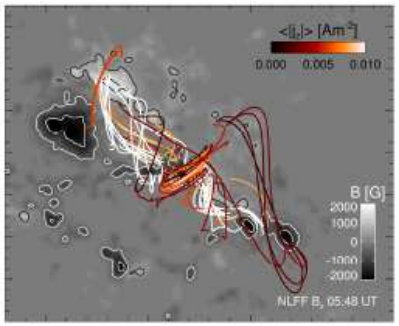
phase II

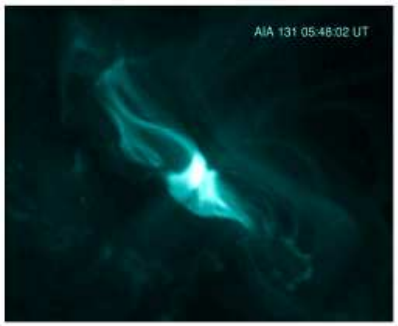
observation of HXR footpoint(s)



tracked flare pixels used as start locations for NLFF field line calculation

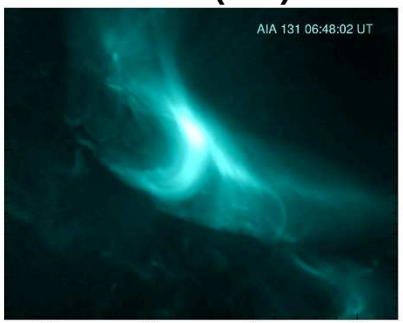




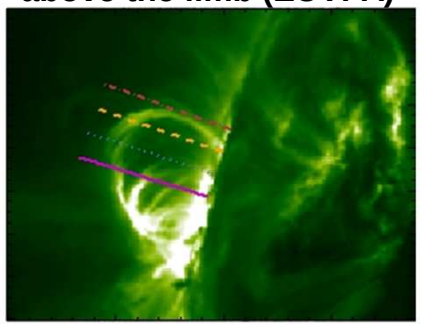


post-flare loops observed in coronal EUV images

on-disk (AIA)



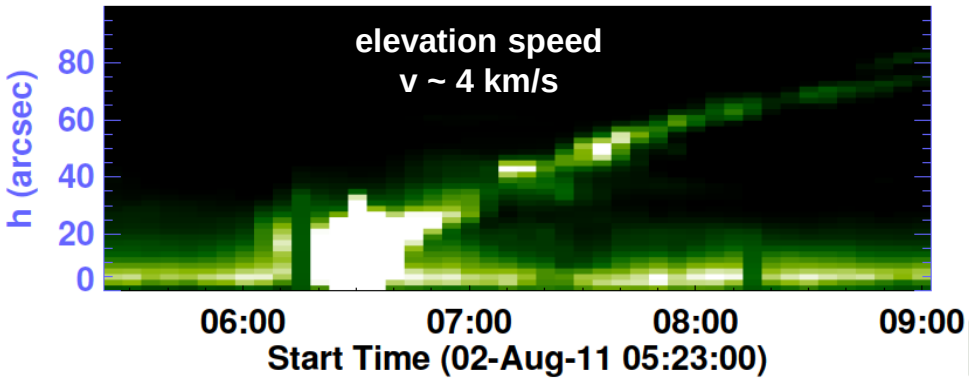
above the limb (EUVI-A)



estimate of elevation speed of the coronal reconnection site

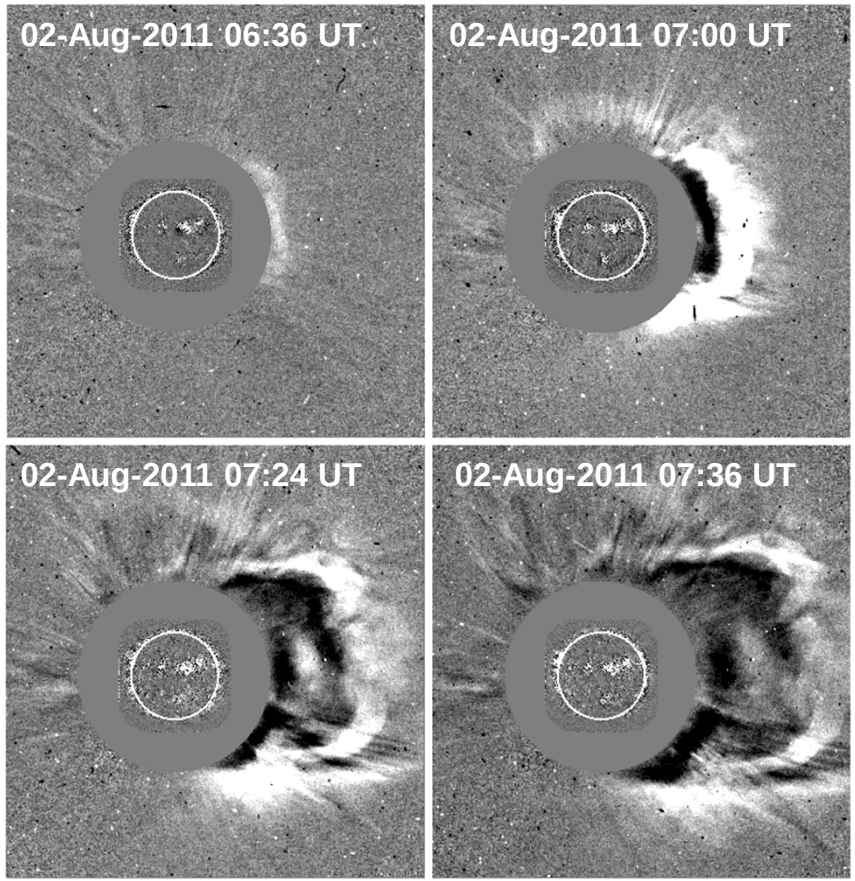
from magnetic field modeling

from coronal observations observations



Coronal mass ejection & post-flare loop system

ejected plasma and magnetic flux (LASCO-C2 white-light)



coronal EUV emission (EUVI-A 195 Å)