

Giant Prominence Eruption associated with fast CME

by

Aabha Monga^{*,1}, Wahab Uddin¹, Ramesh Chandra²

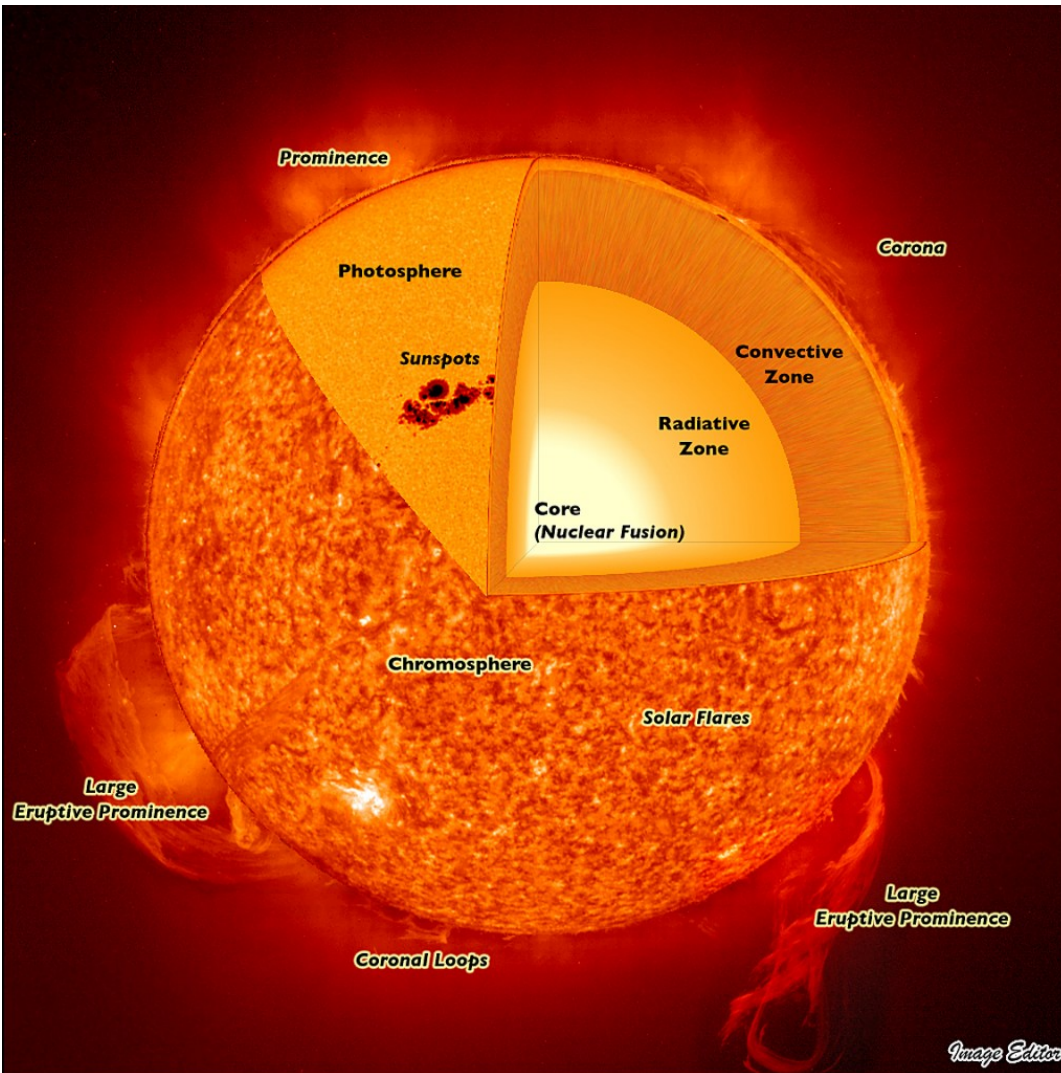
**¹Aryabhata Research Institute of observational sciences
(ARIES), Nainital.**

**²Department of Physics, DSB Campus, Kumaun University,
Nainital.**

Our Mysterious Sun: 25-29 September, 2017, Tbilisi, Georgia

September 29, 2017

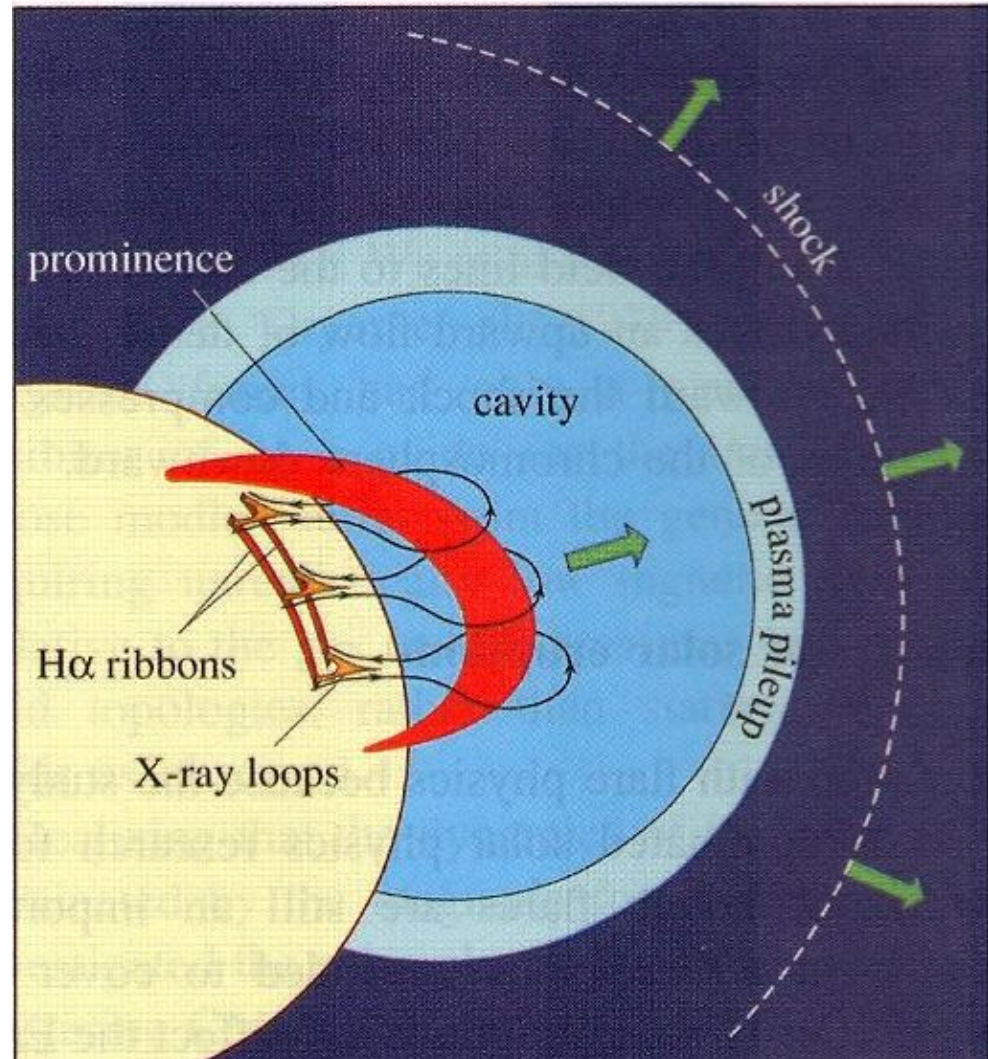
Introduction



- Long term activity: Sunspots
- Short term activity: Solar Flares, Active Filaments/prominences, CMEs, surges etc.
- A solar prominence (also known as a filament when viewed against the solar disk) is a large, bright feature extending outward from the Sun's surface. Prominences are anchored to the Sun's surface in the photosphere, and extend outwards into the Sun's hot outer atmosphere, called the corona.

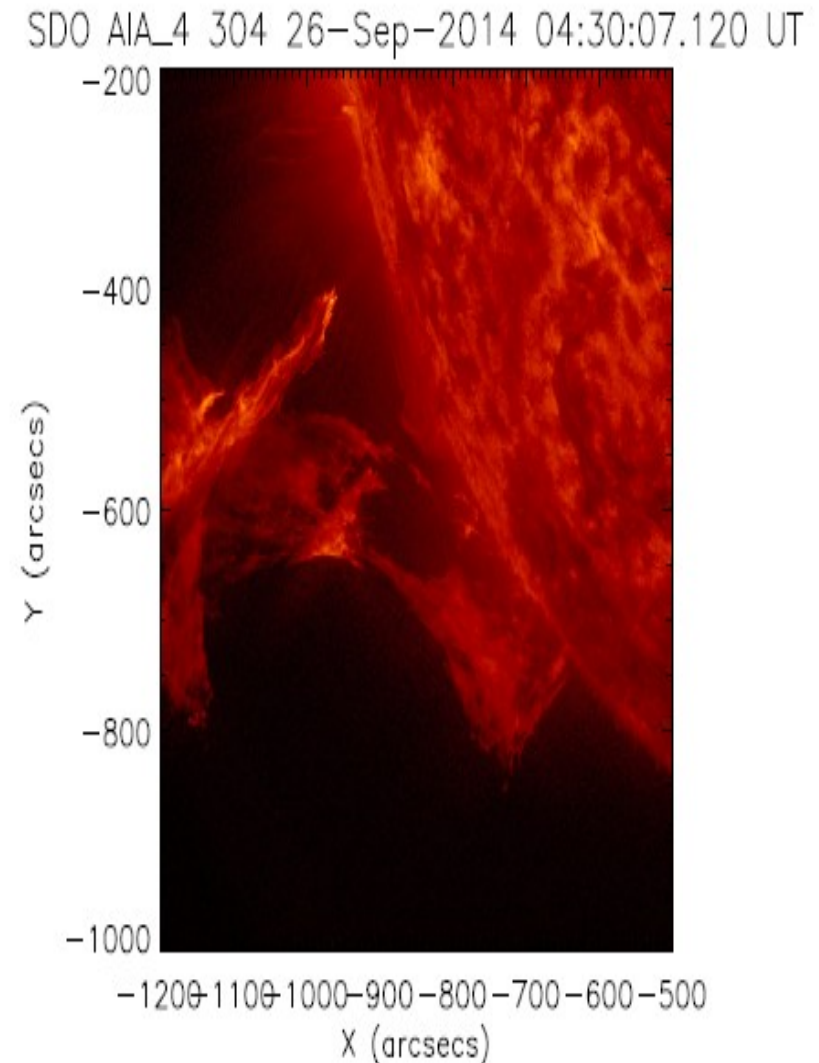
Introduction

- There are many kinds of solar eruptions involve gigantic explosion of energy. The eruption happens when the Sun's interior contorts its own magnetic field.
- A coronal mass ejection (CME) is a large-scale eruption from the solar atmosphere, releasing huge amounts of mass and magnetic flux into the interplanetary space. CMEs may severely affect the space environment at Earth (Gosling 1993; Webb et al. 1994).
- A CME generally presents a three-part structure: a bright front or leading edge, an enclosed dark cavity, and an inner bright core (Illing & Hundhausen 1983; Chen 2011).



Time-line of the event (September 26, 2014)

S. n o.	Time (UT)	Observation
1	04:00	Prominence eruption onset
2	04:28	First appearance of CME in LASCO C2 FOV
3	05:30	First appearance of CME in LASCO C3 FOV
4	05:30	Onset of Type III radio burst



Data sets used

- For EUV/UV analysis: SDO/AIA data
- For optical: ARIES H α
- For CME: Large angle and Spectrometric Coronagraph (LASCO)
- Solar Terrestrial Relations Observatory (STEREO)

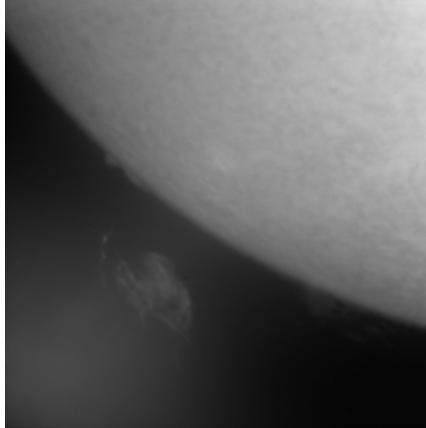
ARIES H α Telescope

- focal length: 225 cm
- Objective lens: 15 cm
- Resolution: 1 arcsec
- Cadence: 5 sec



Prominence evolution in $H\alpha$

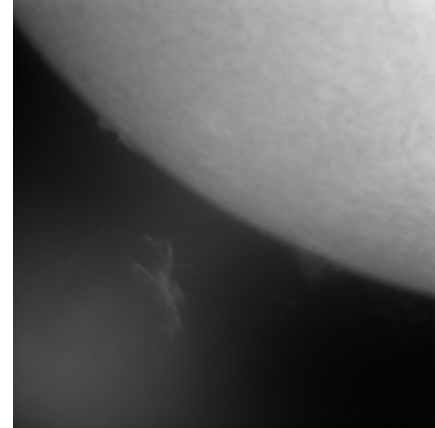
H-alpha 26-Sept-2014 04:19 UT



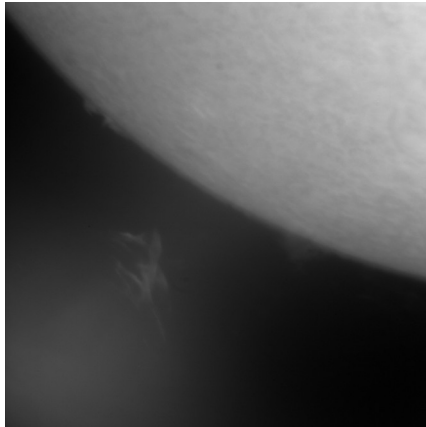
H-alpha 26-Sept-2014 04:21 UT



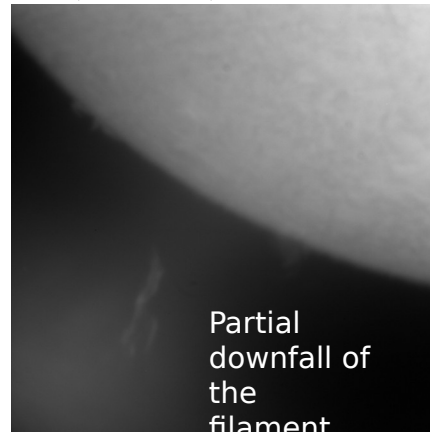
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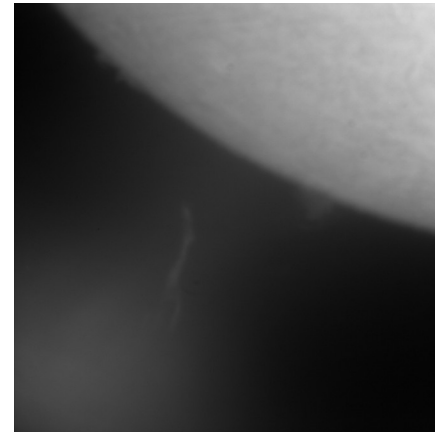
H-alpha 26-Sept-2014 04:23 UT



H-alpha 26-Sept-2014 04:28 UT



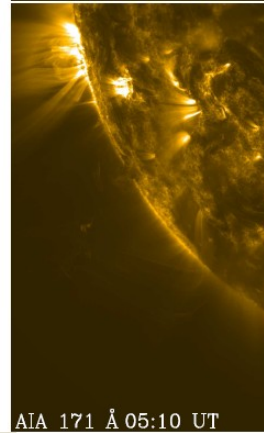
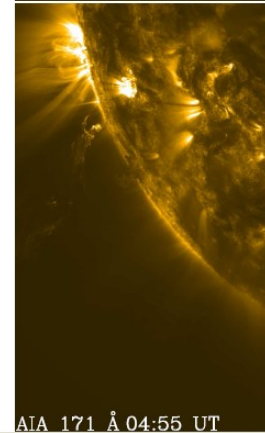
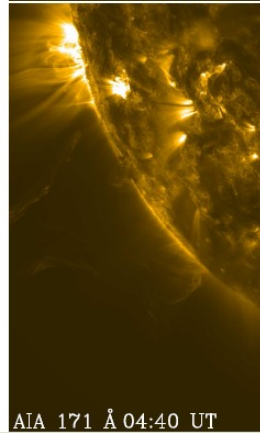
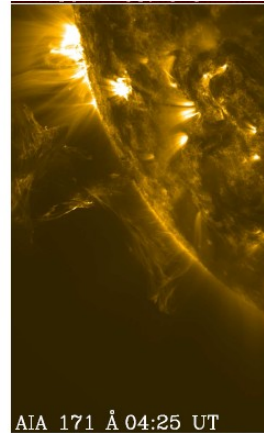
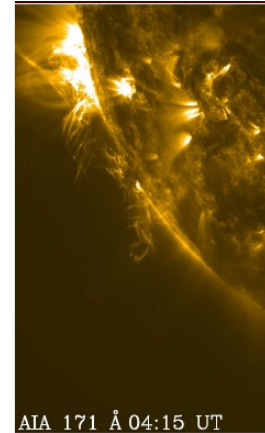
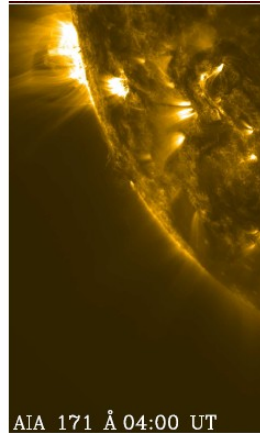
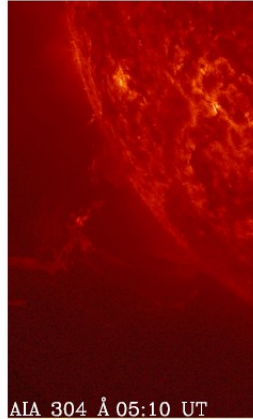
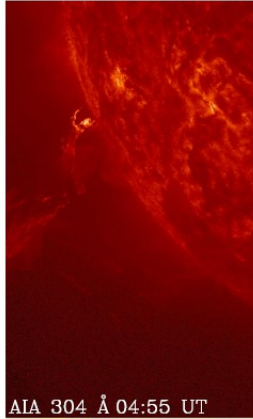
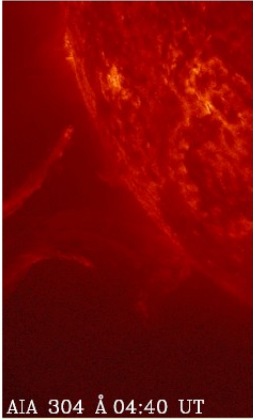
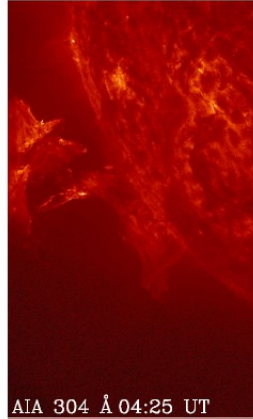
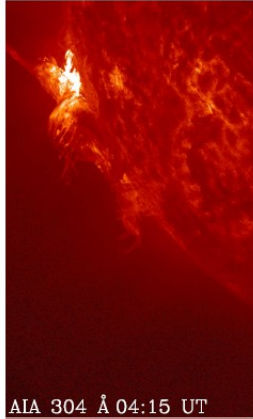
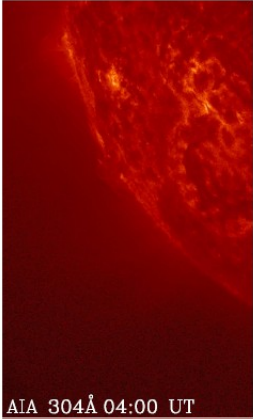
H-alpha 26-Sept-2014 04:31 UT



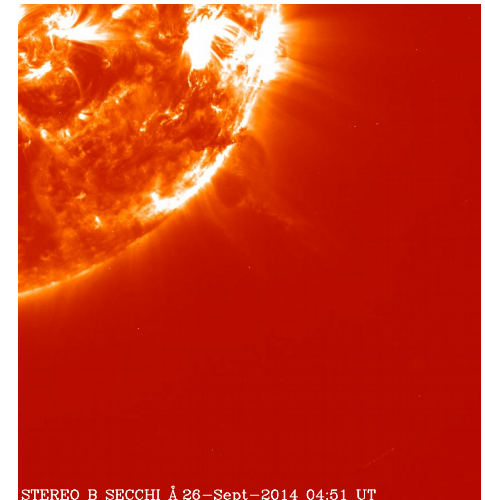
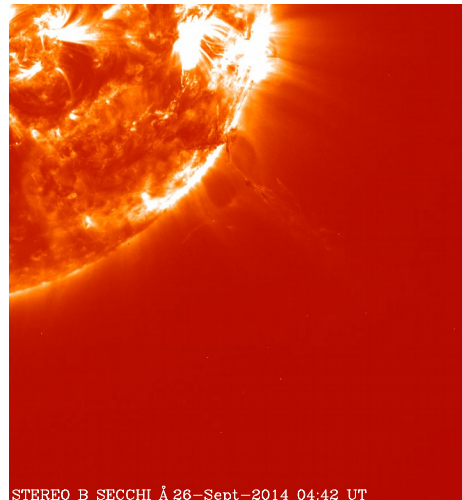
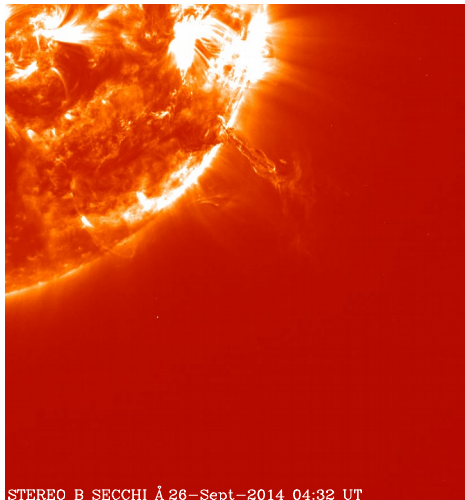
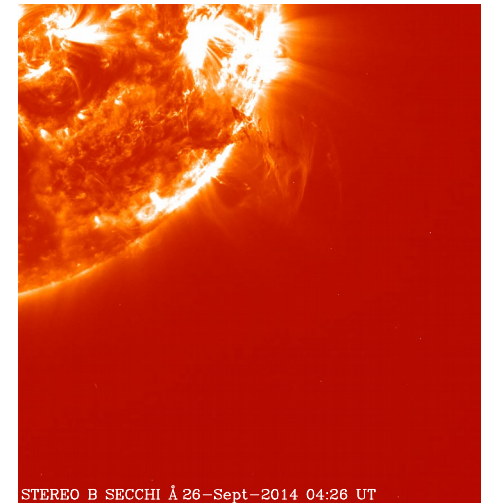
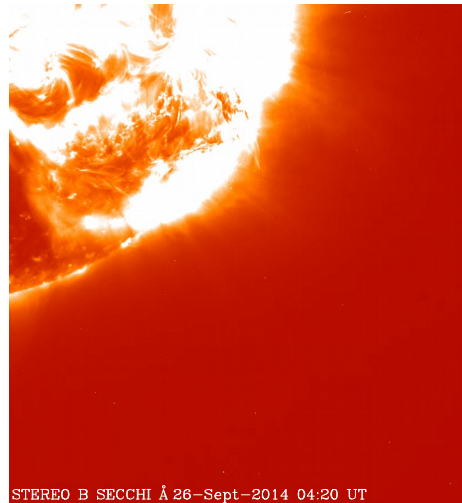
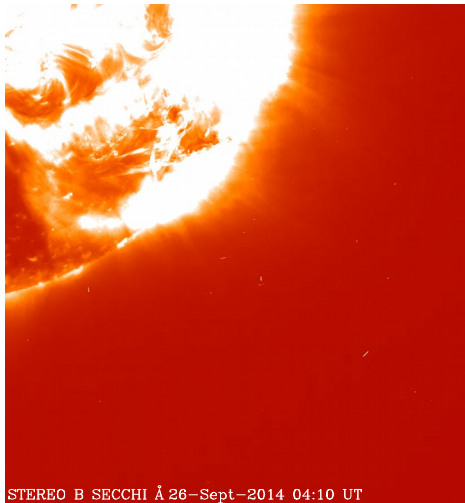
Calculation in H α

- Initial velocity: 84kms⁻¹
- Mean velocity: 250 kms⁻¹
- Maximum velocity: 530 kms⁻¹
- Minimum velocity: 84 kms⁻¹
- Mean mass of the bundle of flux ropes: 4.1×10^{18} kg
- Average Kinetic energy of the prominence: 3.847×10^{31} erg

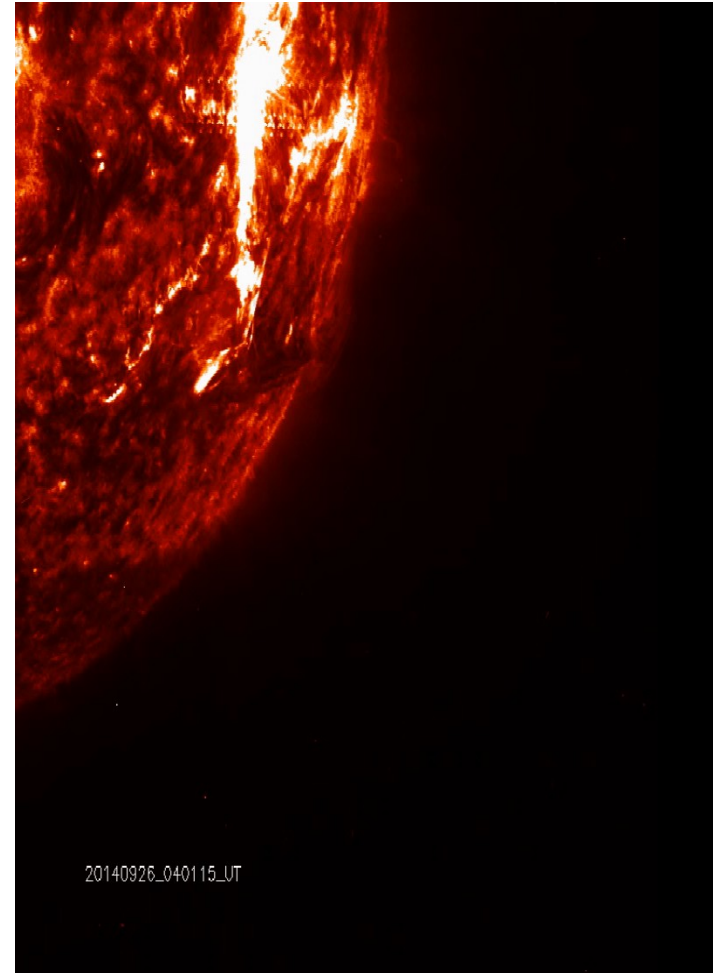
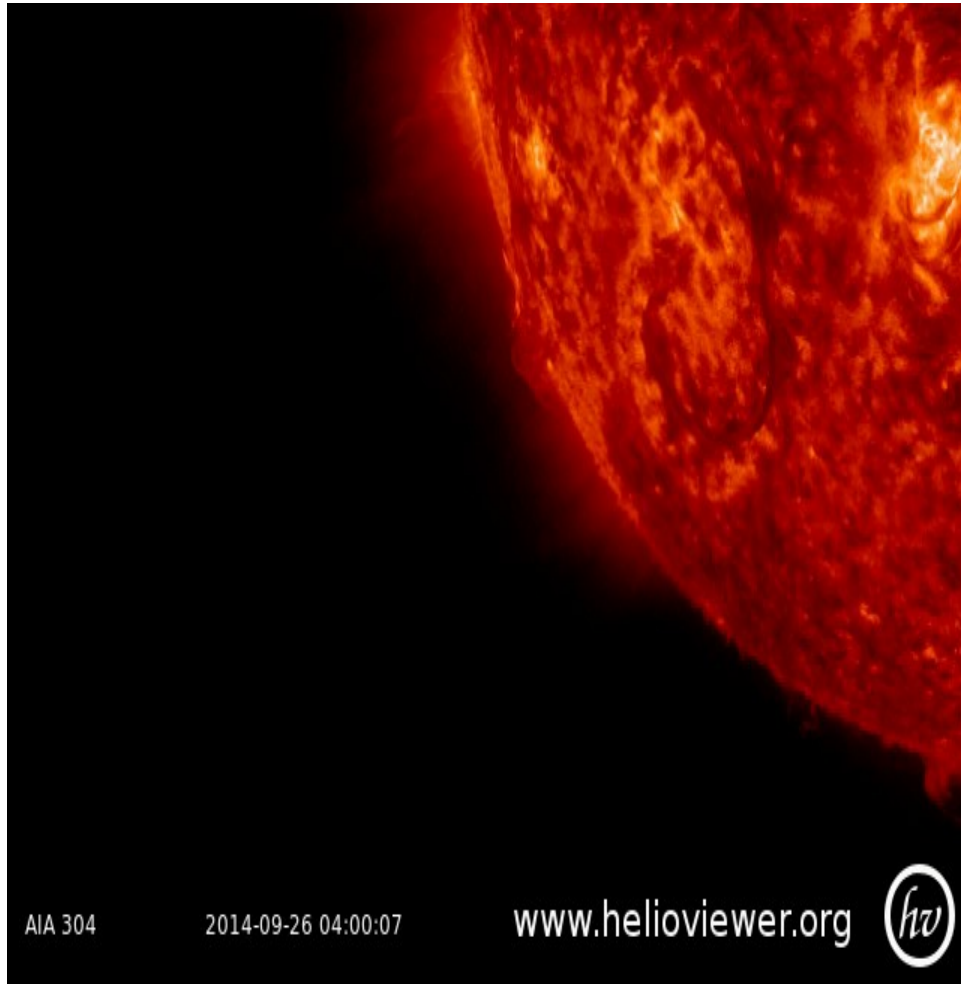
Prominence evolution in AIA



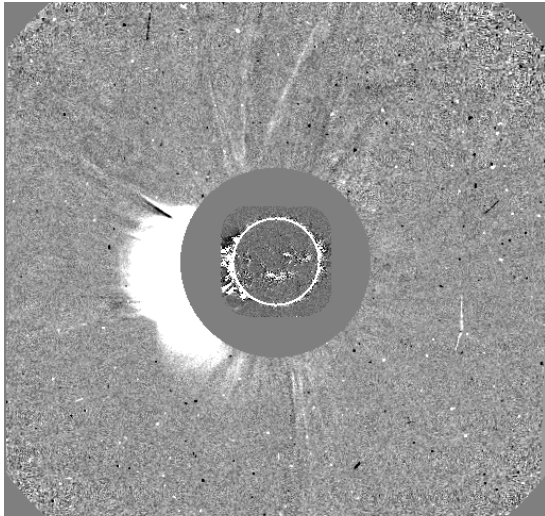
Prominence evolution in STEREO



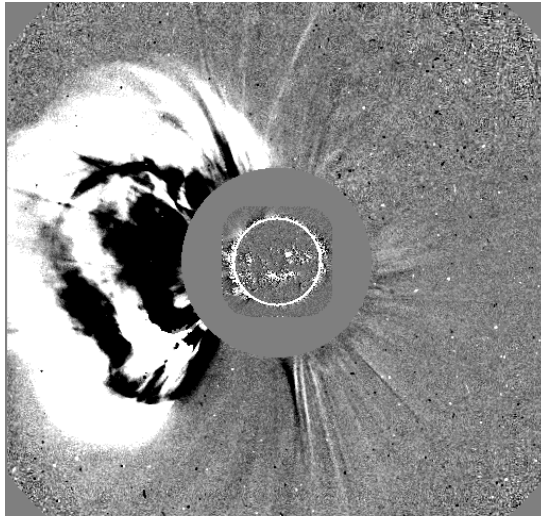
AIA and STEREO movies



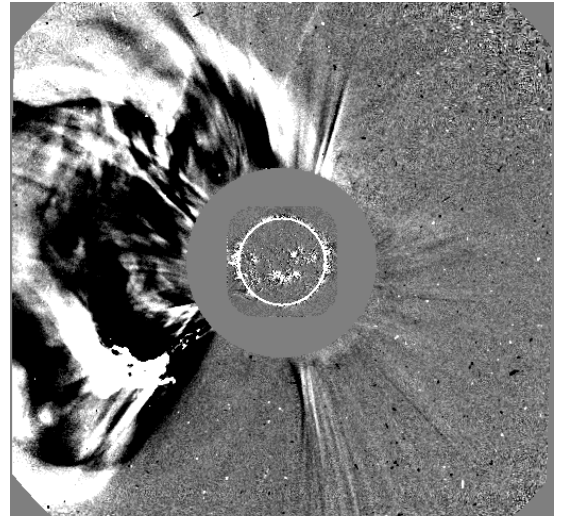
LASCO C2 and C3 FOV



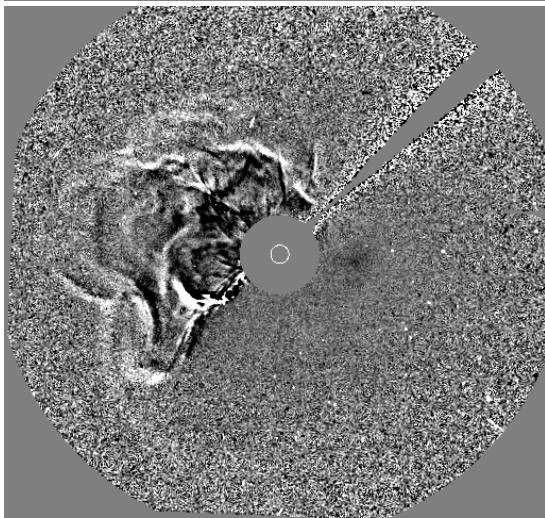
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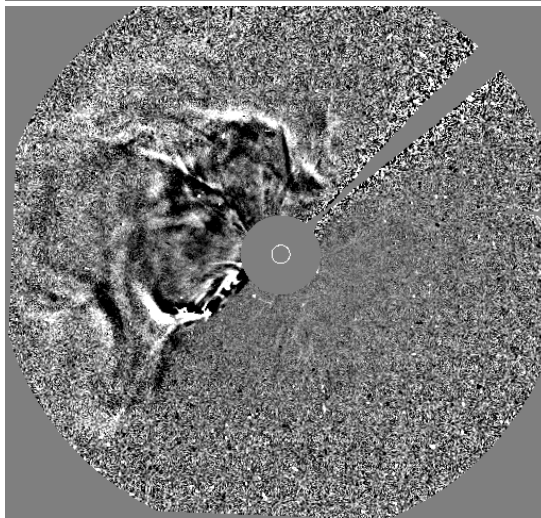
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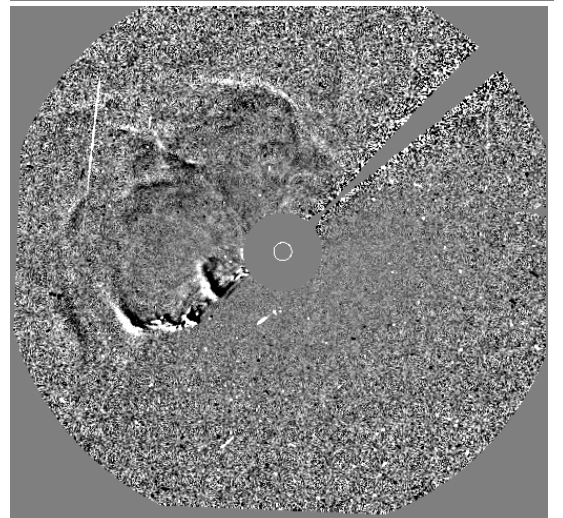
C2: 2014/09/26 05:36 AIA 193: 09/26 05:36



C3: 2014/09/26 07:42:06

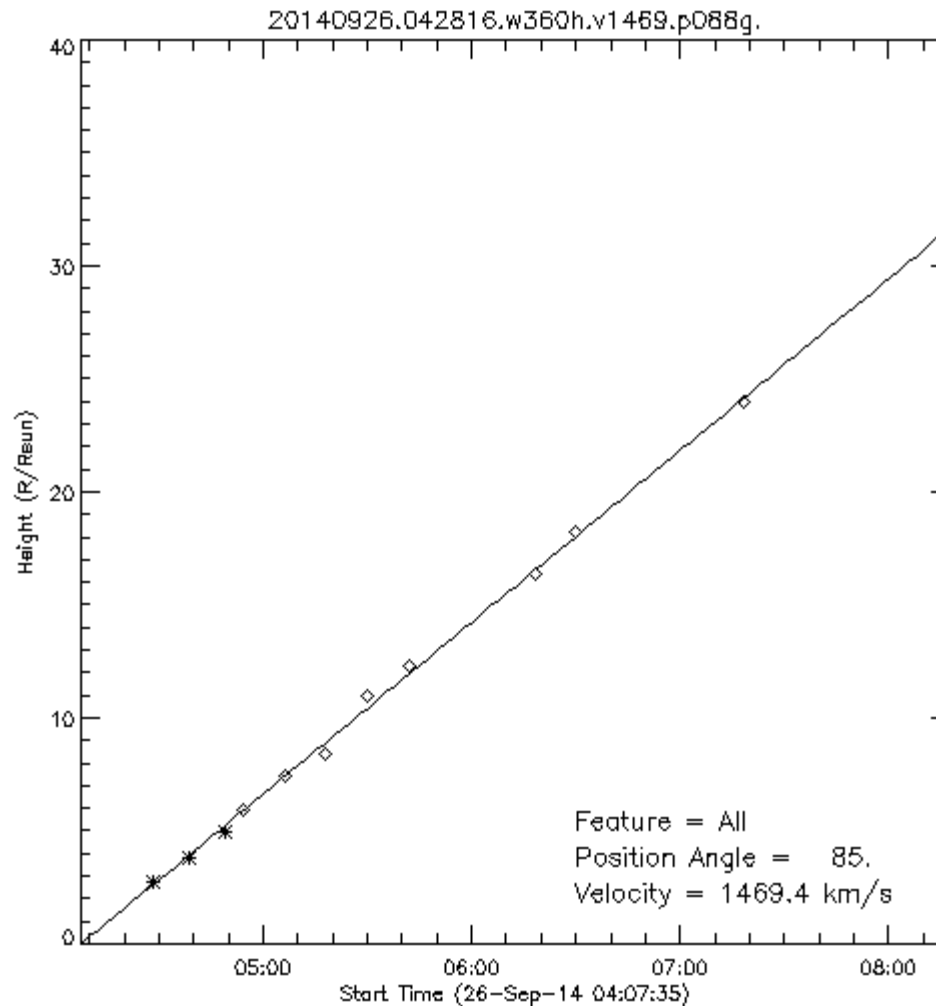


C3: 2014/09/26 09:06:05

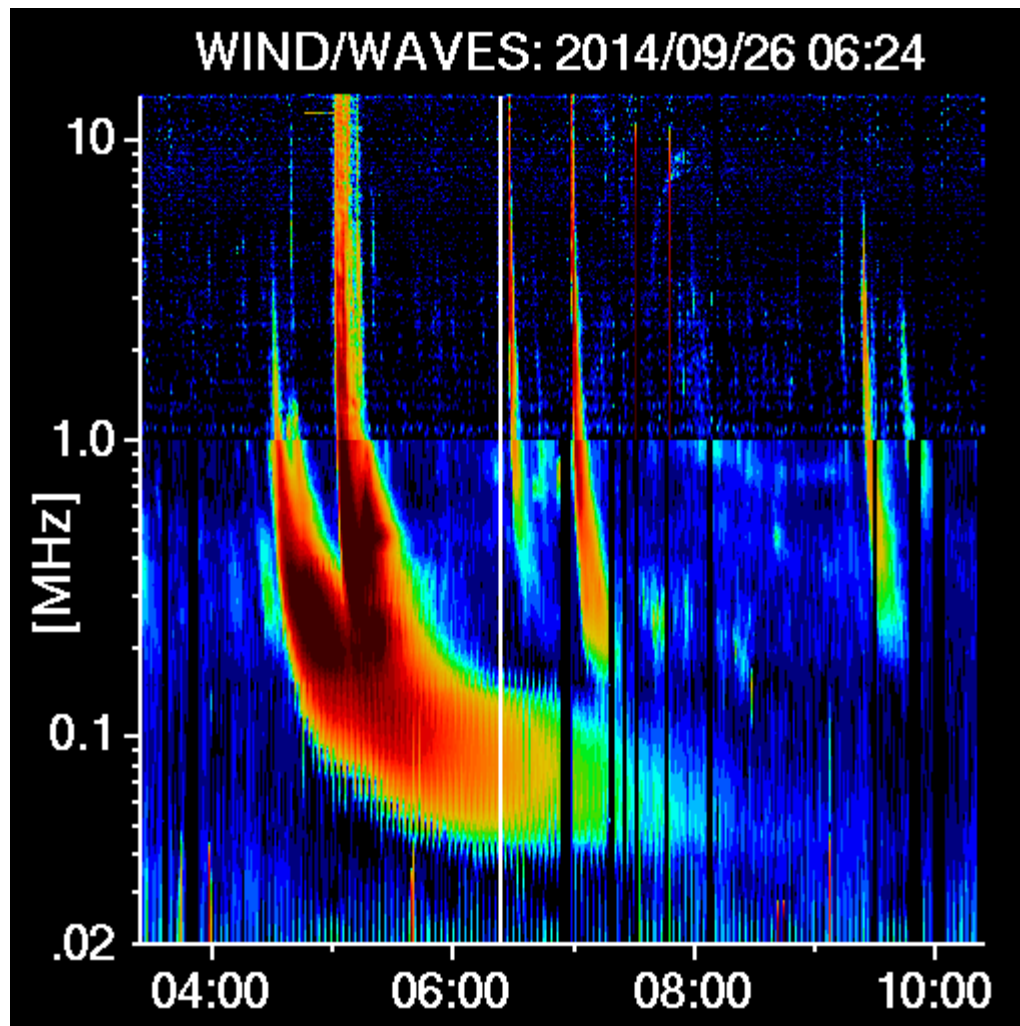


C3: 2014/09/26 10:30:05

Height-time analysis of the CME



Radio bursts in WIND/WAVE



Summary

- The dynamic prominence eruption was highly energetic consists bundle of flux ropes.
- The prominence eruption was associated with fast CME having speed 1469kms^{-1} .
- Height of the CME in LASCO FOV $30 R_{\text{Sun}}$.
- Most of the filament escapes the solar surface and partially falls over that.
- Type III radio bursts has been observed which are responsible for the particle accleration.
- Speed of the prominence eruption computed in $\text{H}\alpha$ is 250 kms^{-1} .
- The observable phenomena of the eruption satisfies the tether-cutting and kink instability.



***Thank you for your kind
attention***