

Stable Compound Flux Rope Formation via Merging of Filament Channels

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나빈 찬드라 조시

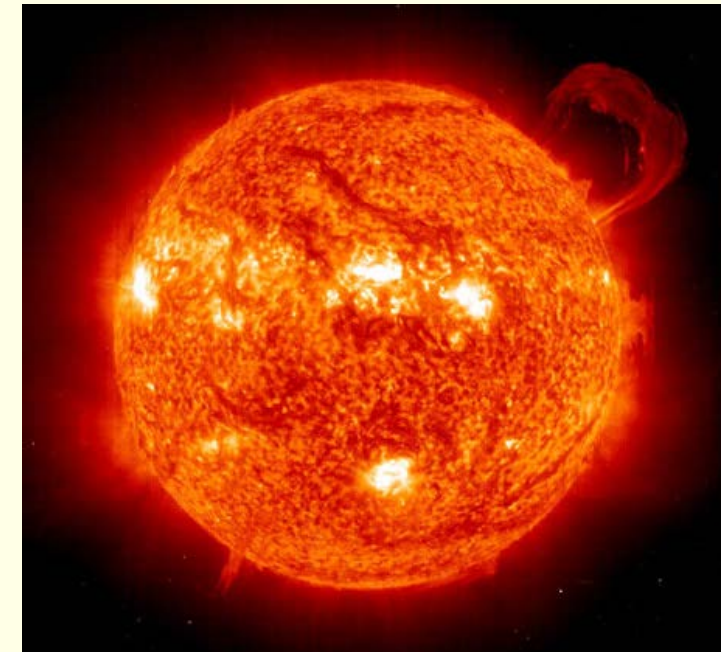
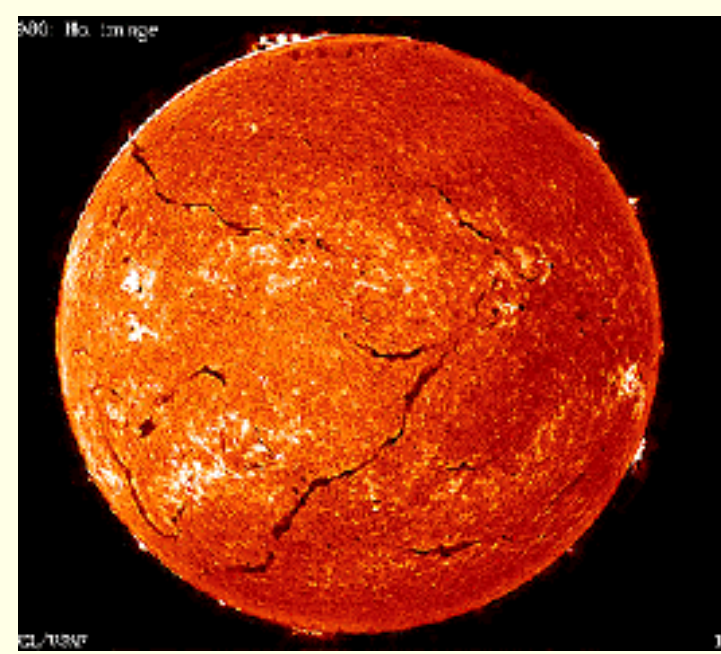
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Satoshi Inoue

- ✓ *Filaments are the cool and dark plasma material suspended in the hot low laying corona with the support of magnetic field (Martin 1998; Mackay et al. 2010; Labrosse et al. 2010).*
- ✓ *These filaments undergo eruptions due to the imbalance between upward magnetic pressure and downward magnetic tension and gravity forces.*
- ✓ *Overlaying magnetic field plays an crucial role in the eruption as well as the **stability of filaments and the flux ropes**.*
- ✓ *Several models such as “tether cutting”, “magnetic breakout” have also been given in order to explain the eruption phenomena (Antiochos et al. 1999; Moore et al. 2001).*
- ✓ *Two nearby filaments sometimes show the **merging/interaction dynamics**.*



Motivations:

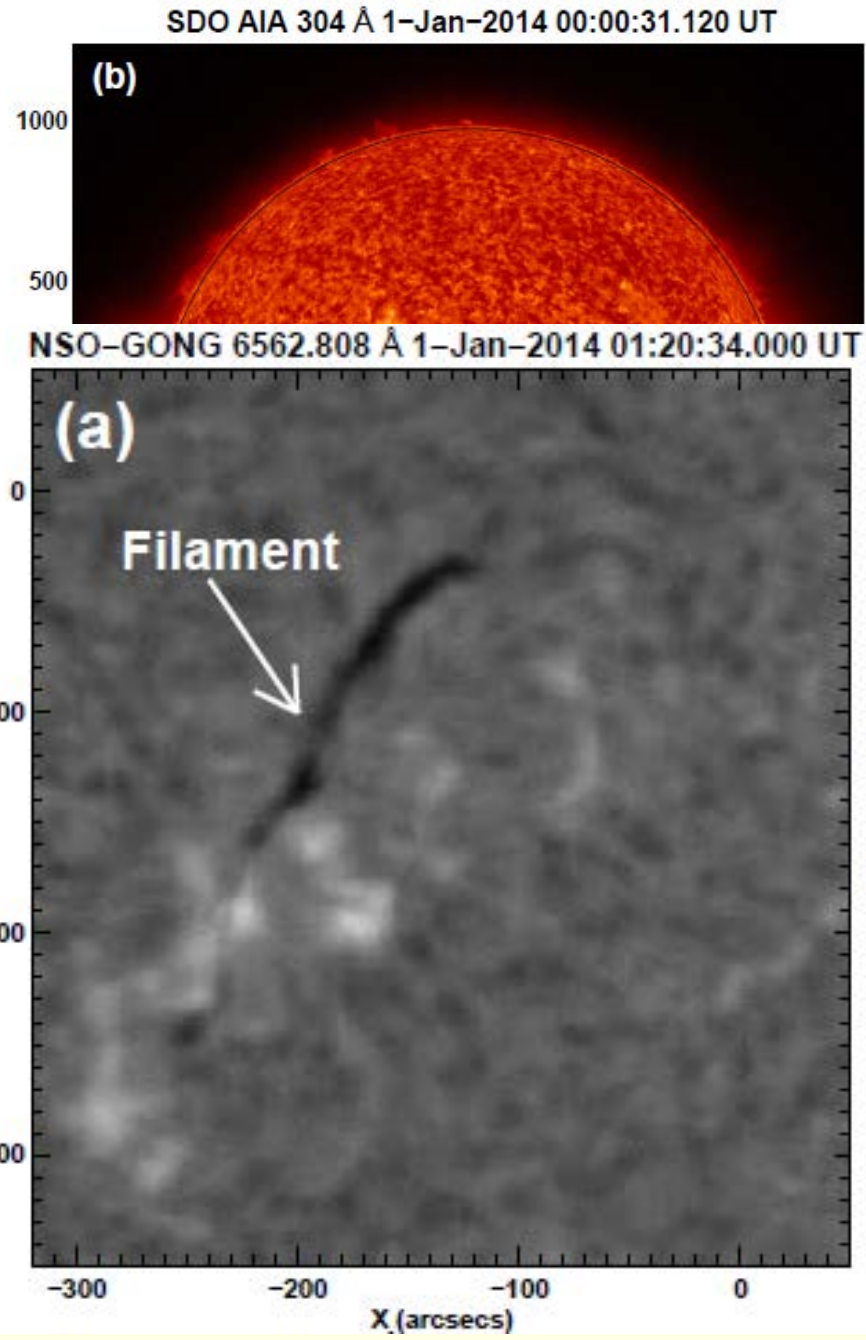
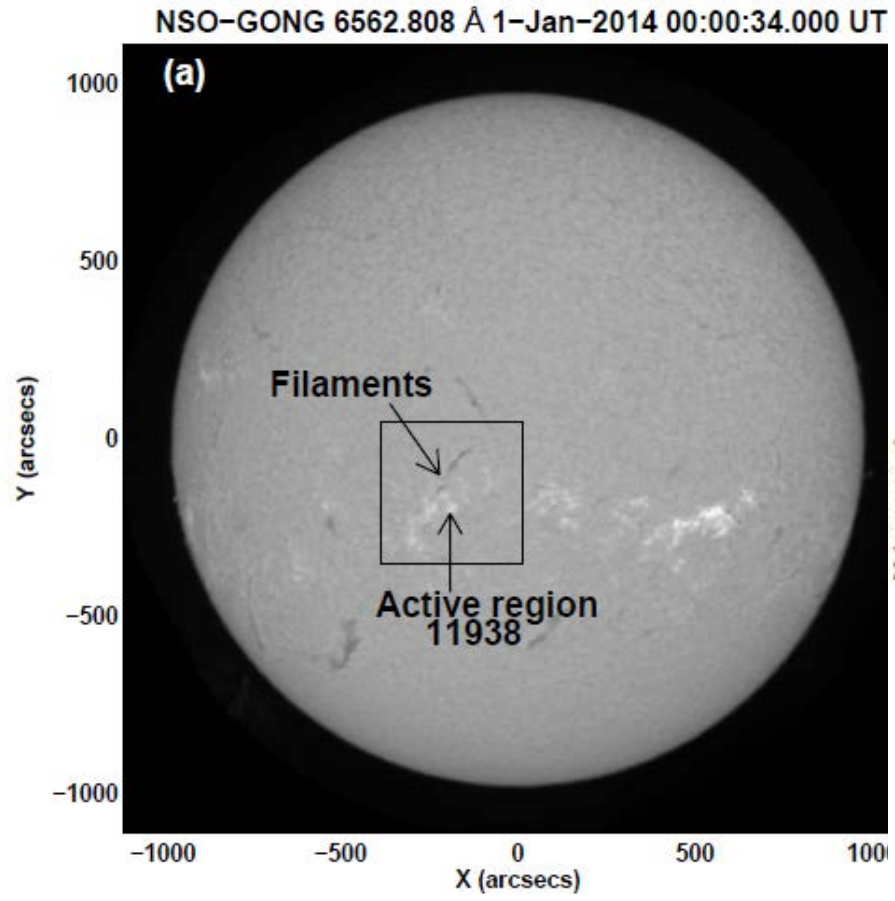
- Filaments (or filaments channels) merging/interaction dynamics are rarely observed.
- Observational studies of huge disk-center filaments stable/eruption conditions may play an significant role to forecast the initial eruption conditions as well as space weather.

Observational Data Set Used:

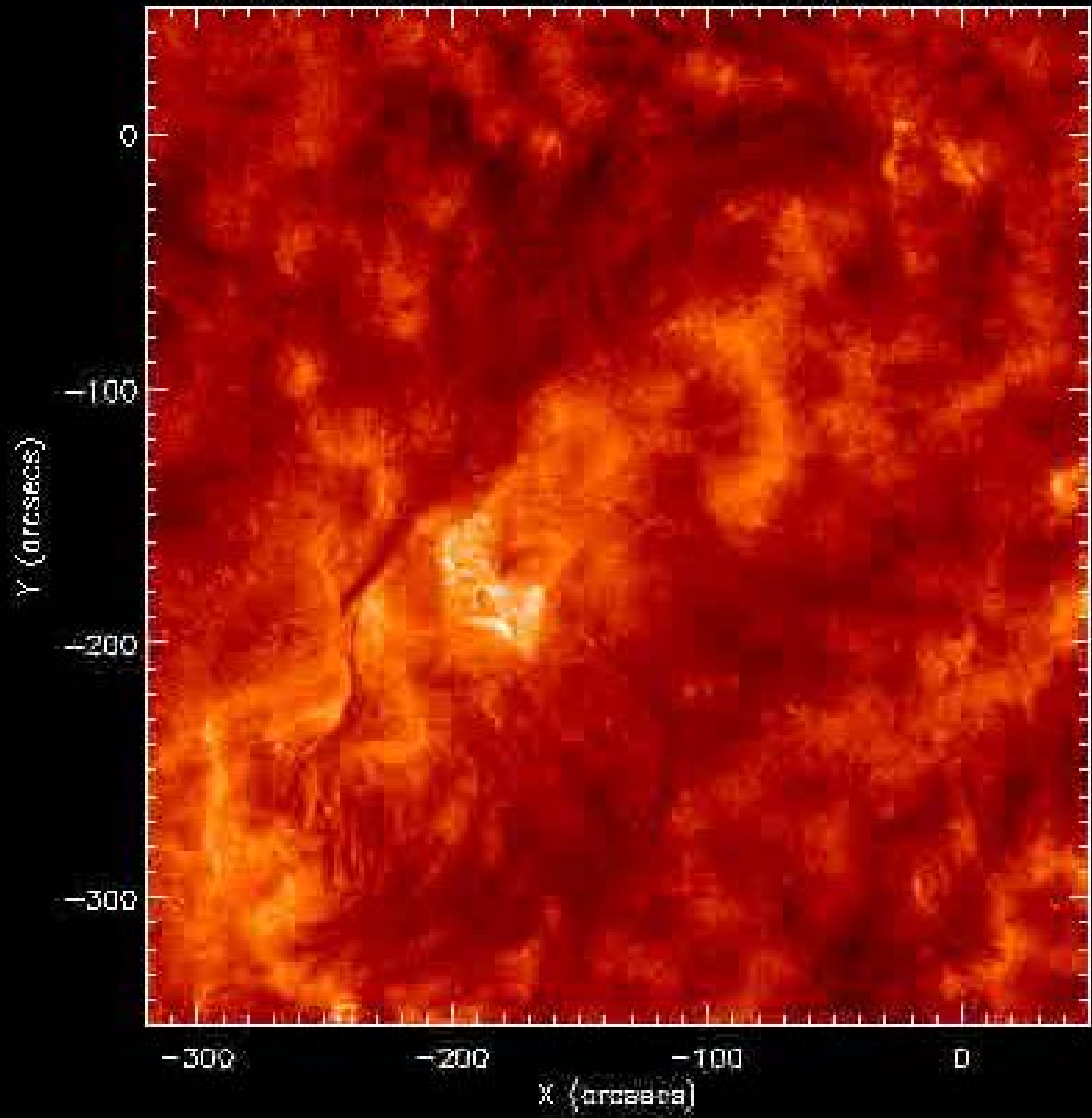
- NSO-GONO H α
- SDO-AIA
- SDO-HMI
- RHESSI X-ray Data

Multiwavelength Observations

Filaments location

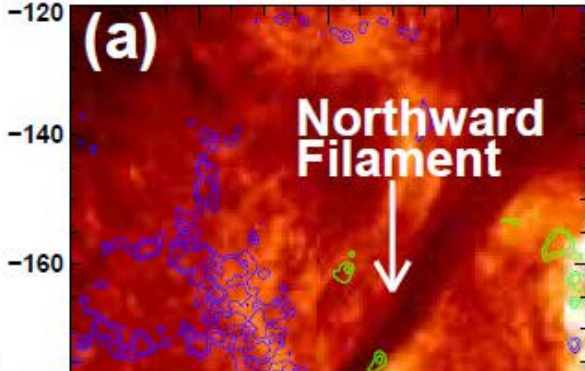


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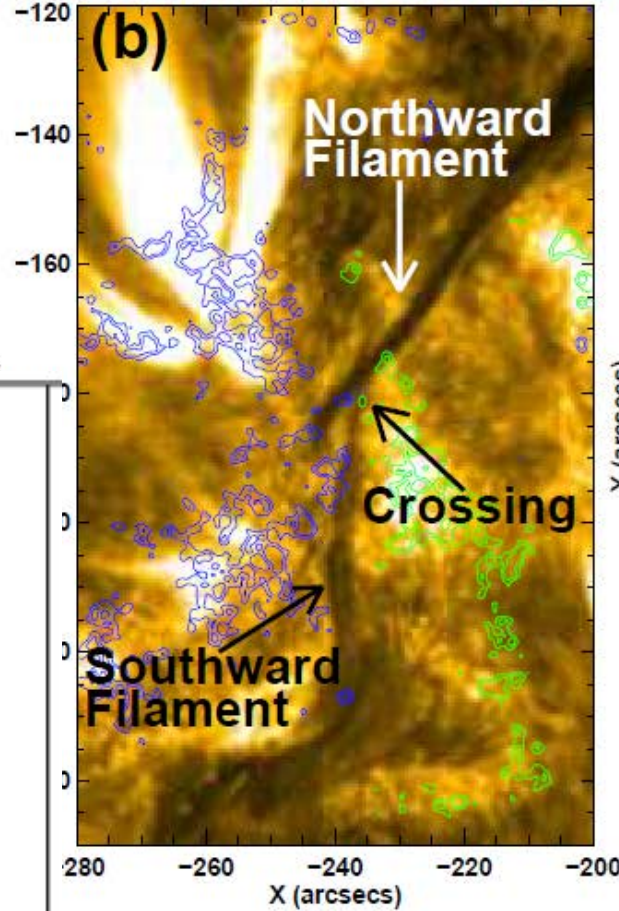


Initial Condition of Filaments

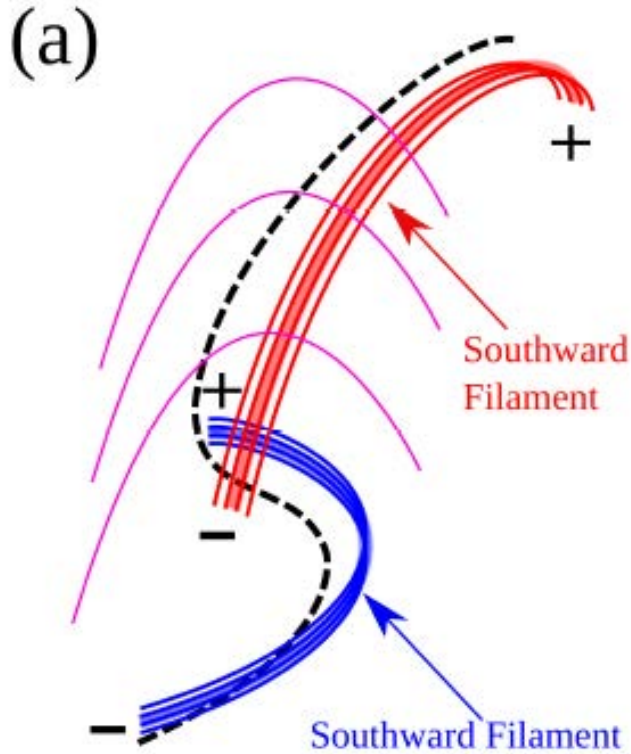
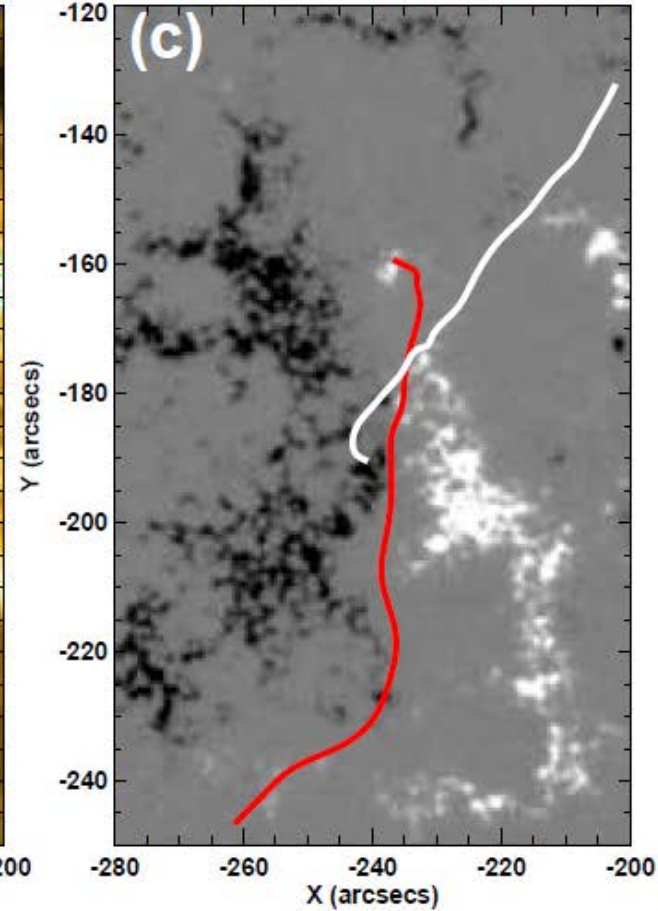
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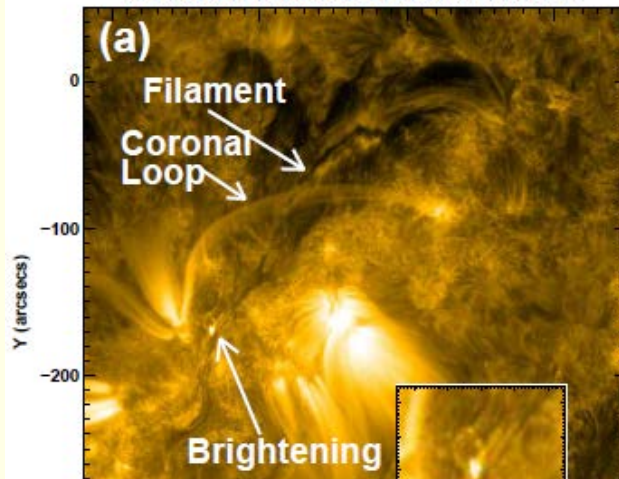


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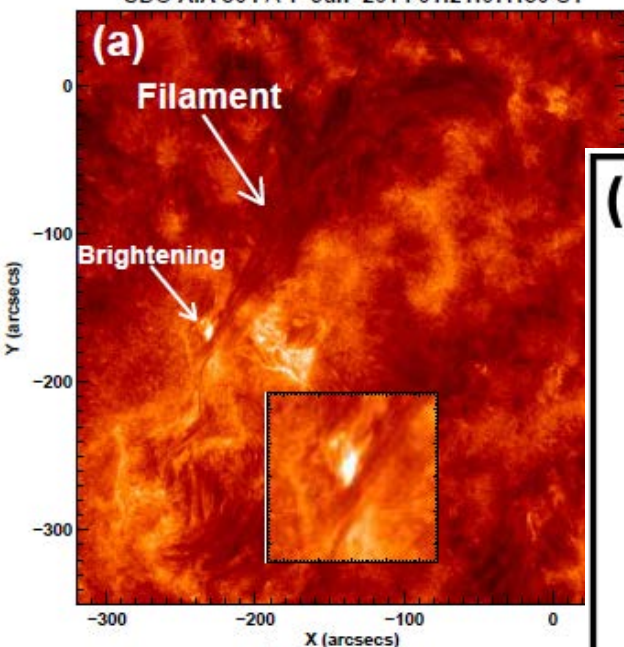


Initial Brightening

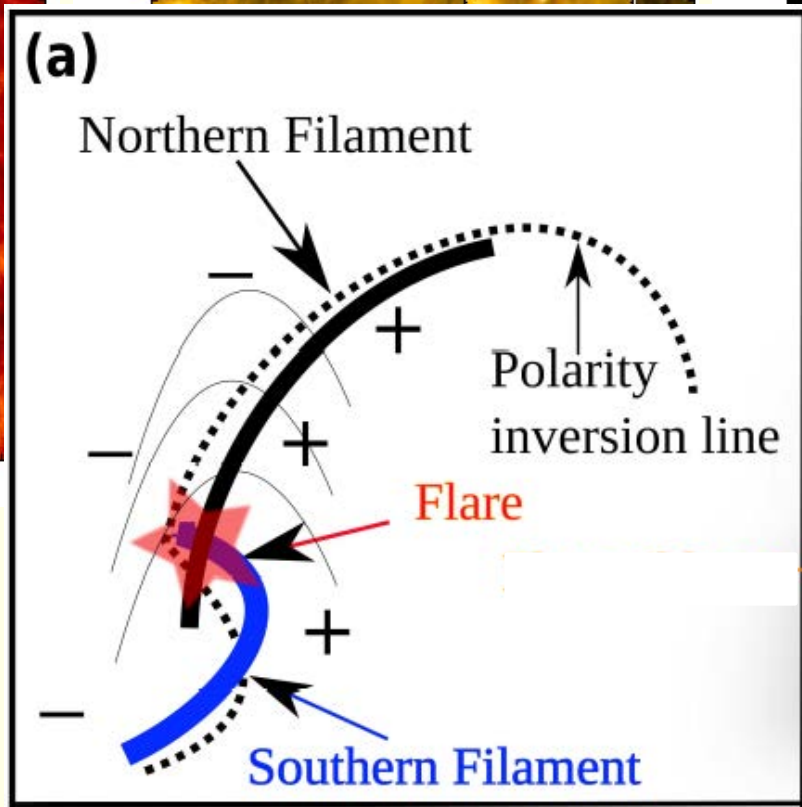
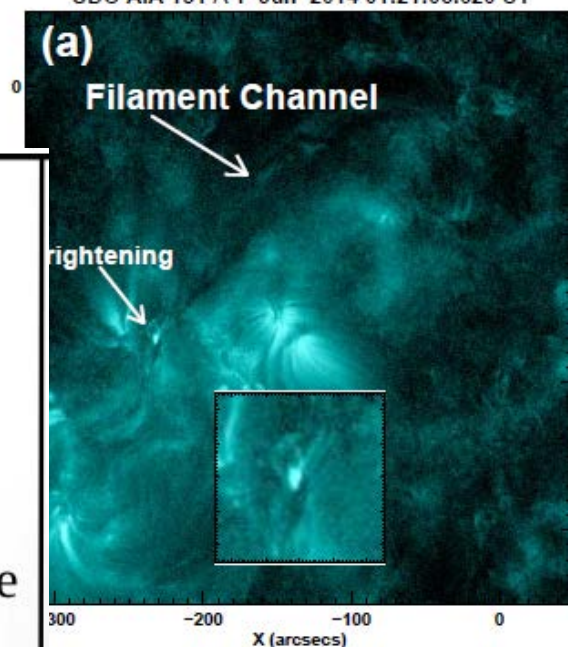
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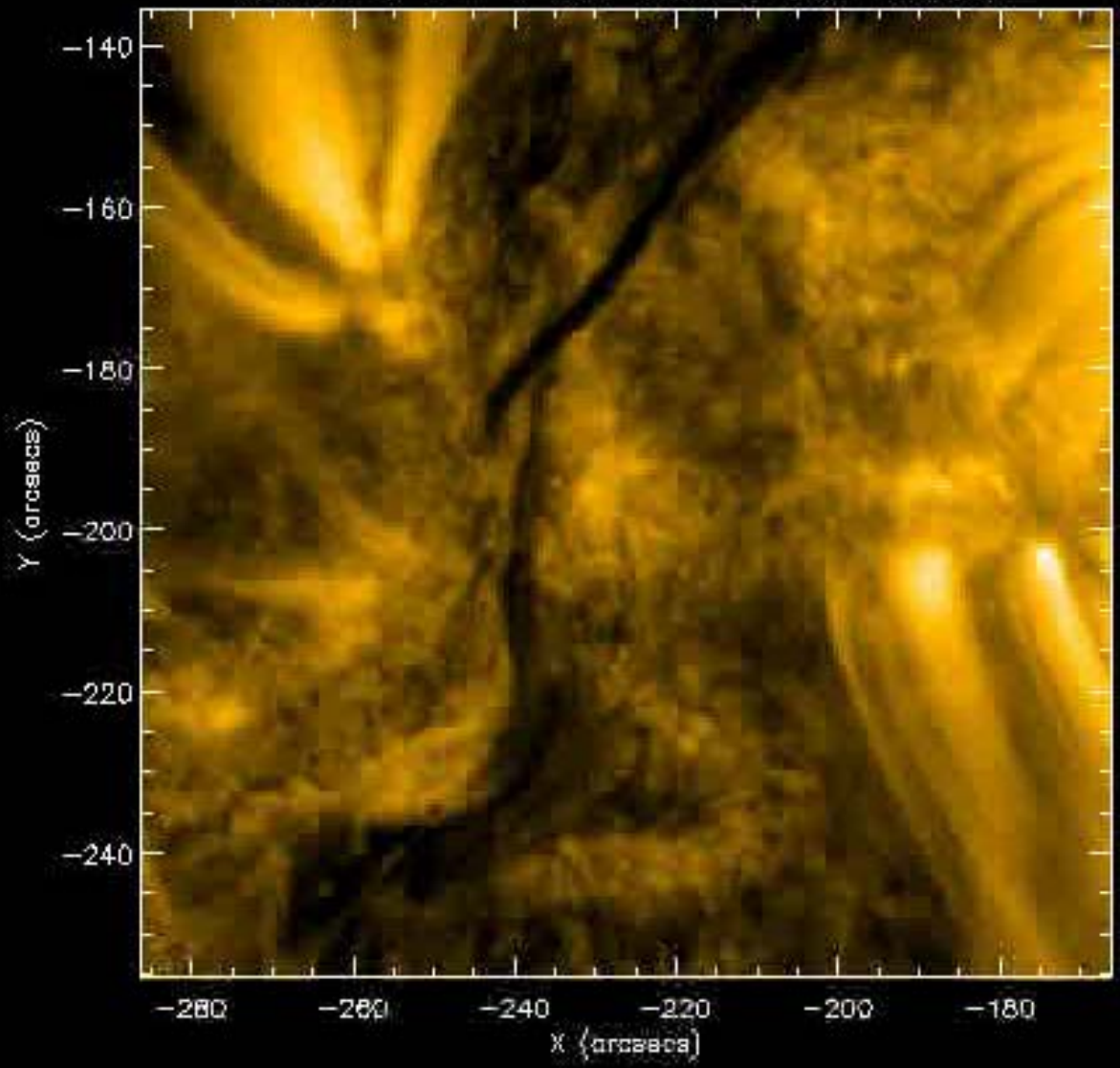
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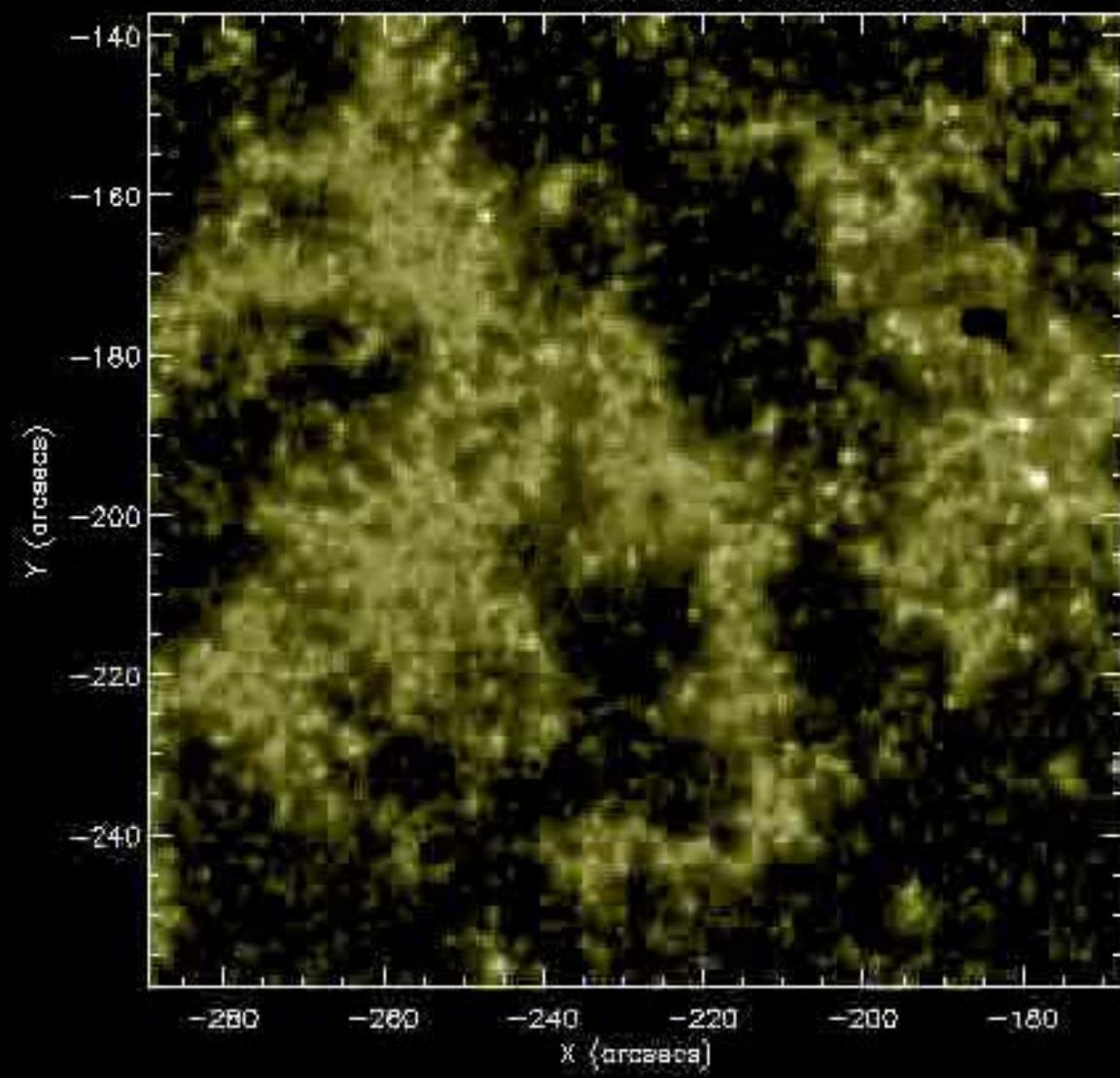
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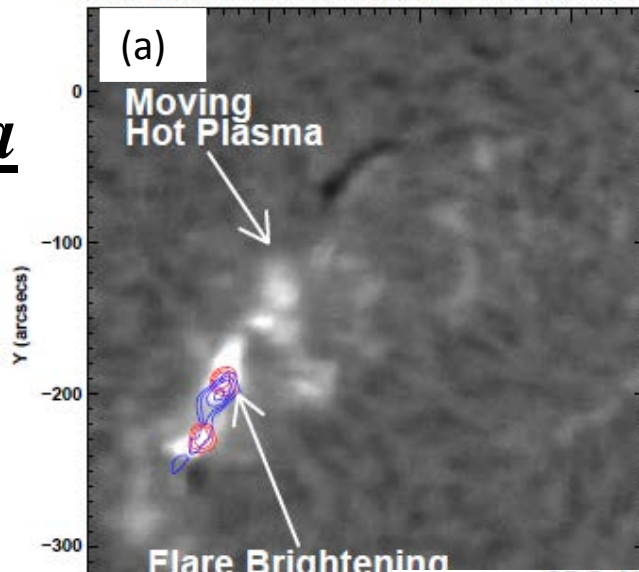


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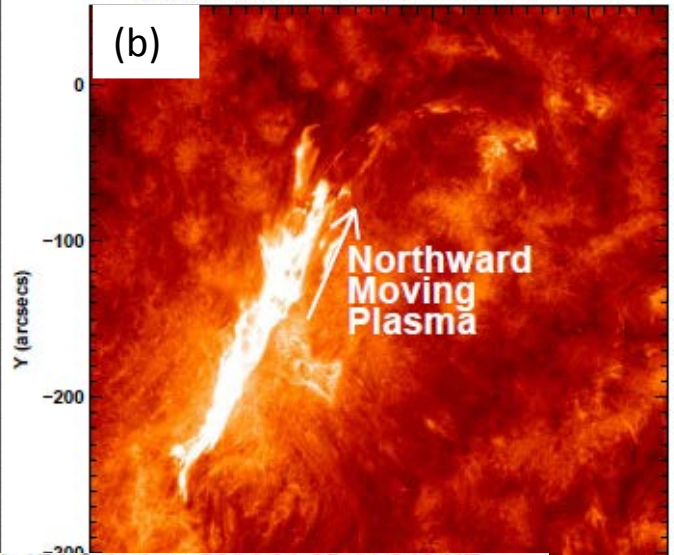


Northward and Southward Plasma Motion

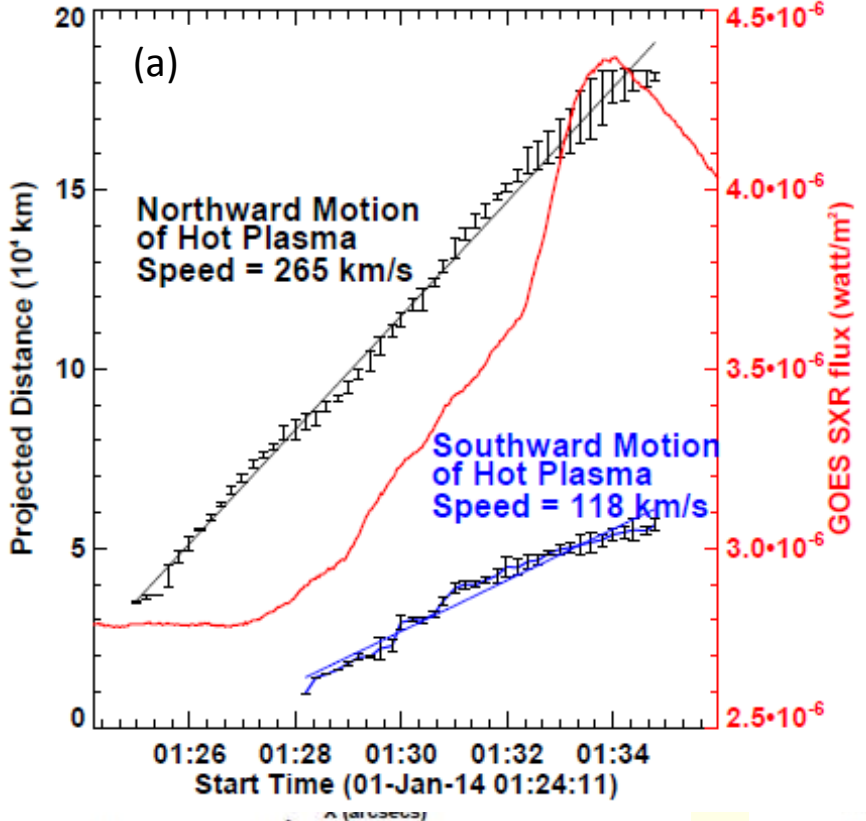
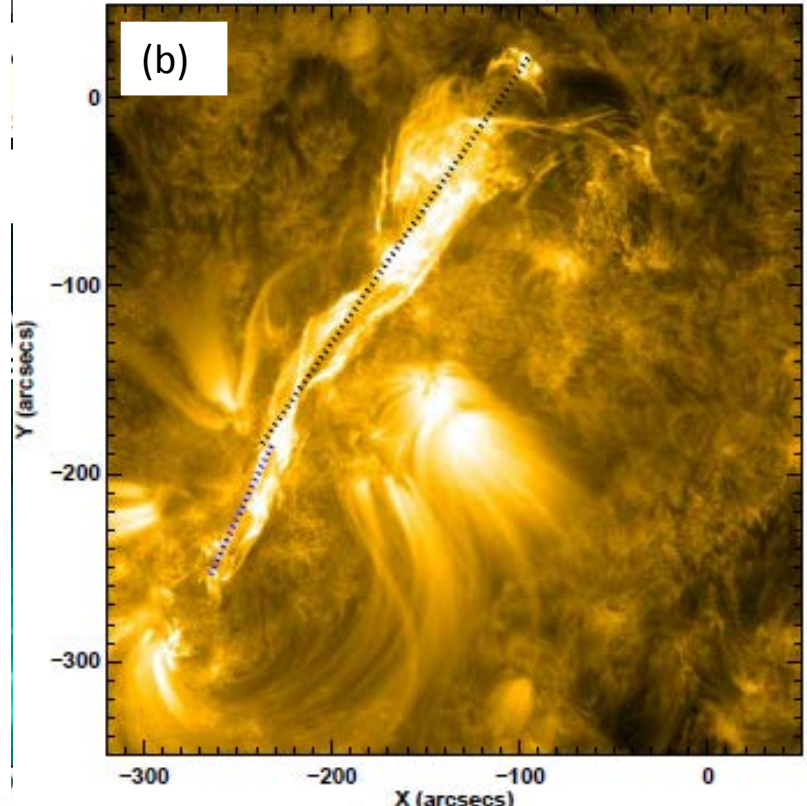
NSO-GONG 6562.808 Å 1-Jan-2014 01:30:34.000 UT



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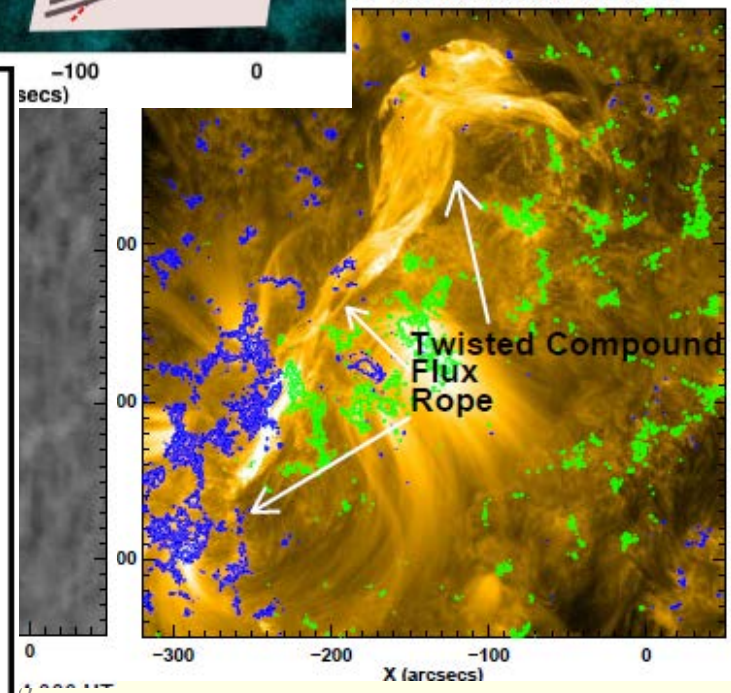
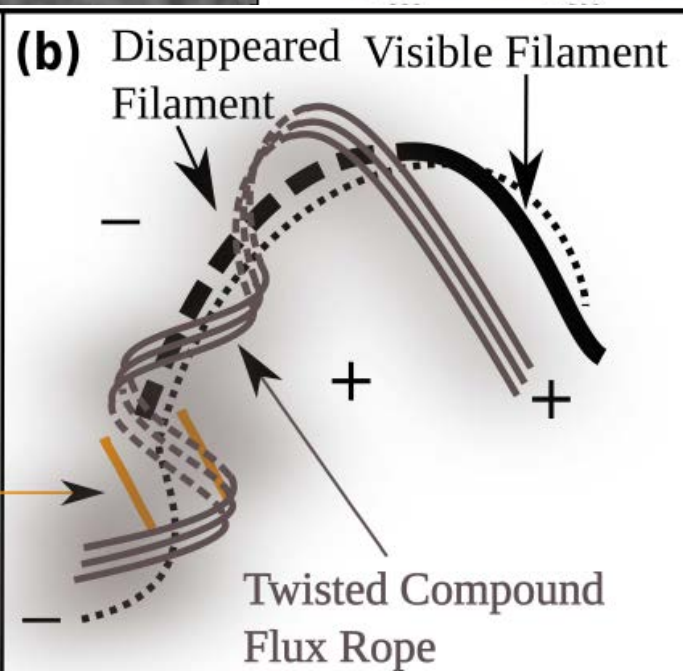
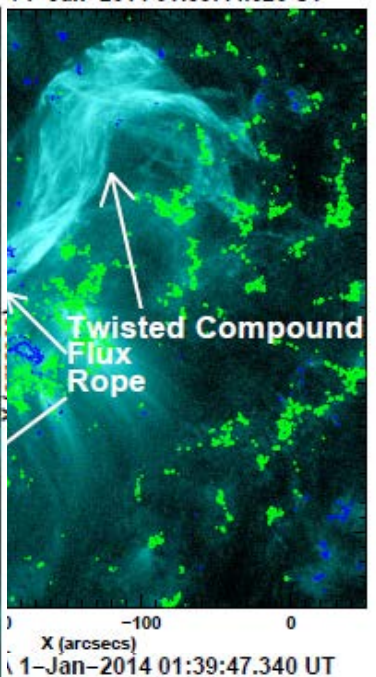
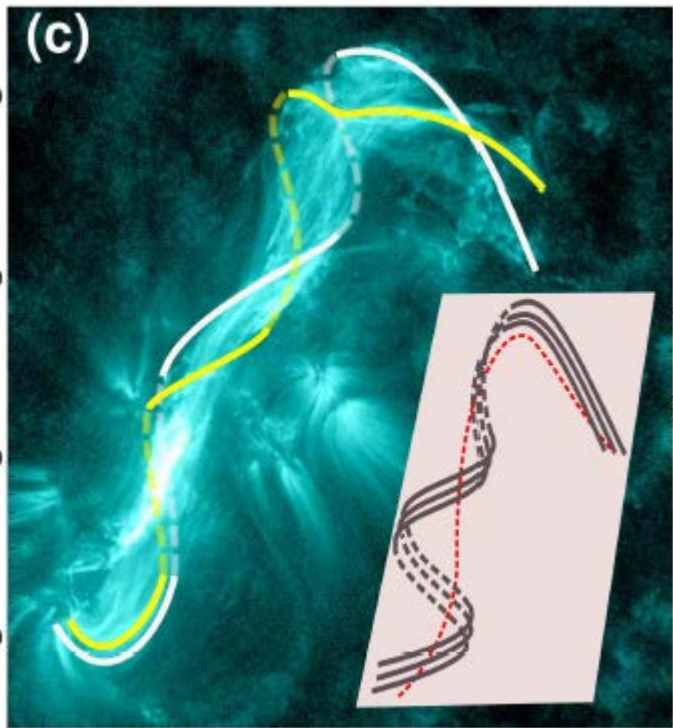
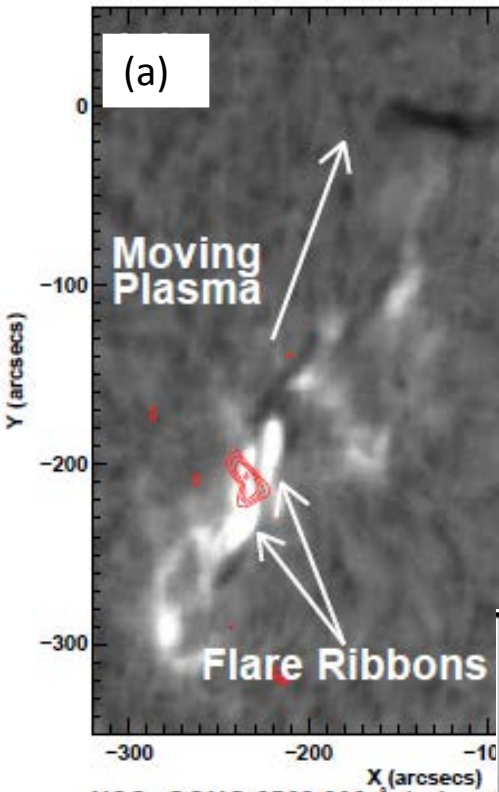


Visible Flux rope

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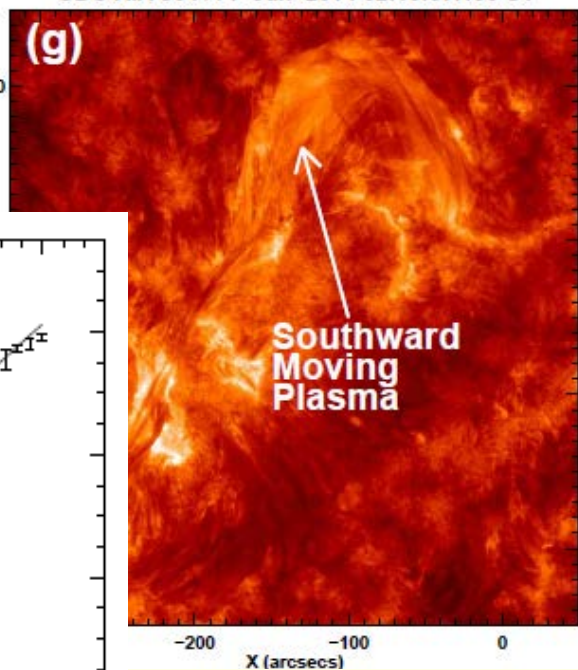
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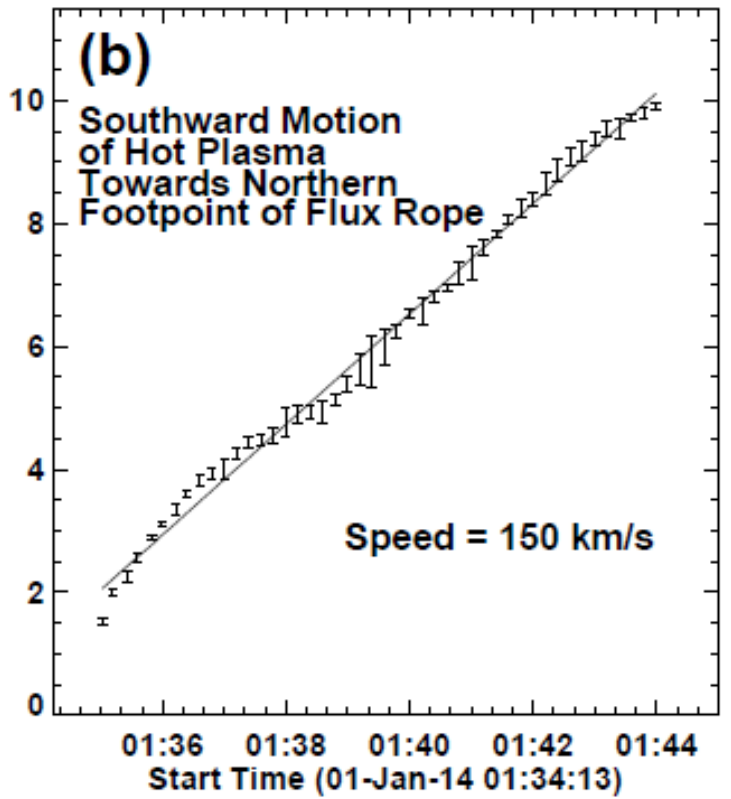
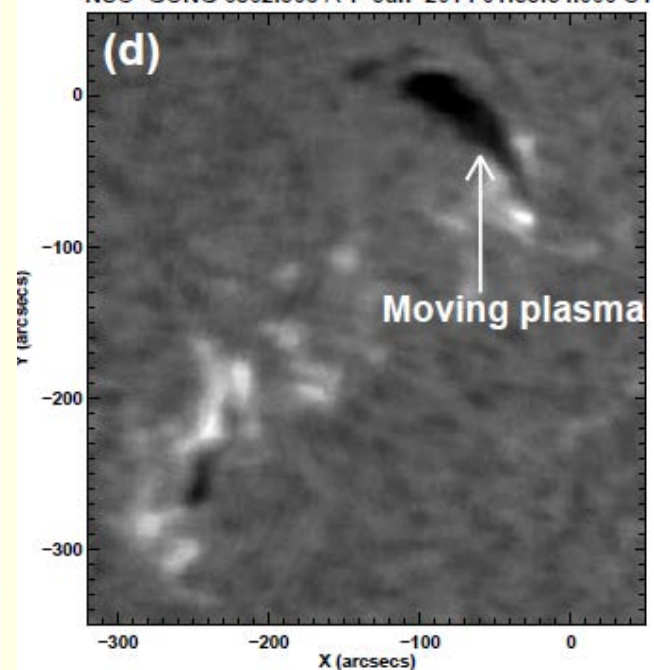


Plasma Dynamics

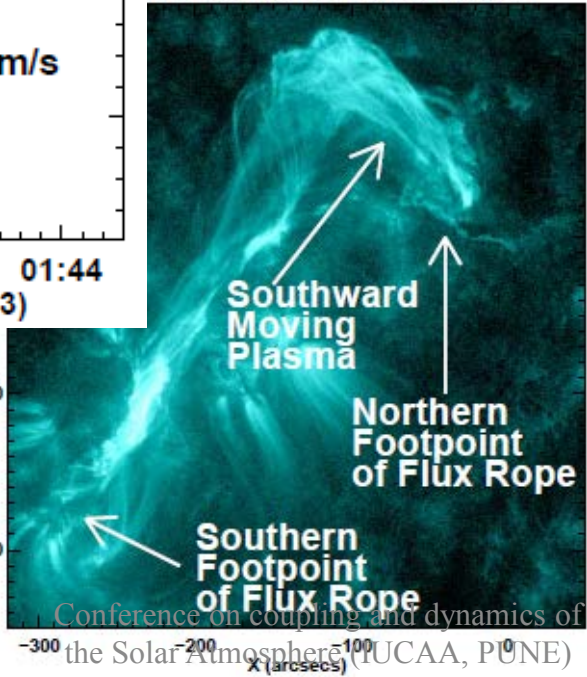
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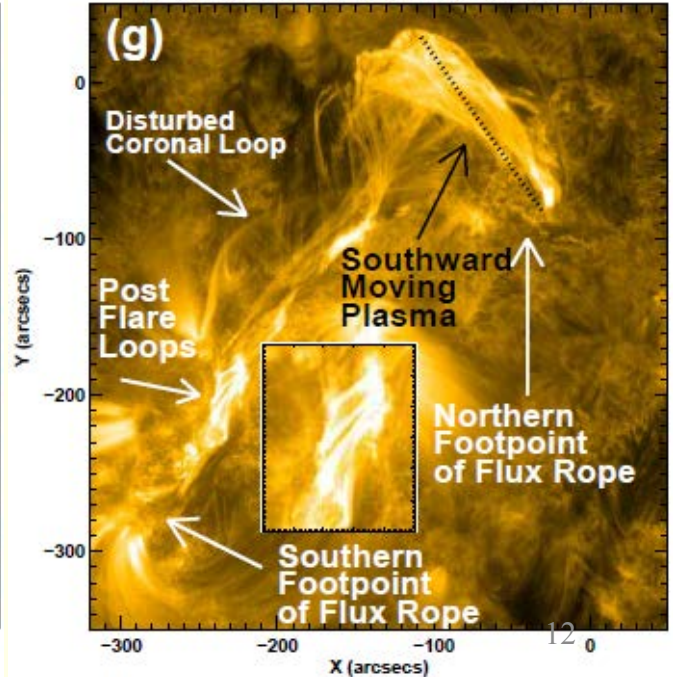
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A 131 Å 1-Jan-2014 01:45:20.620 UT

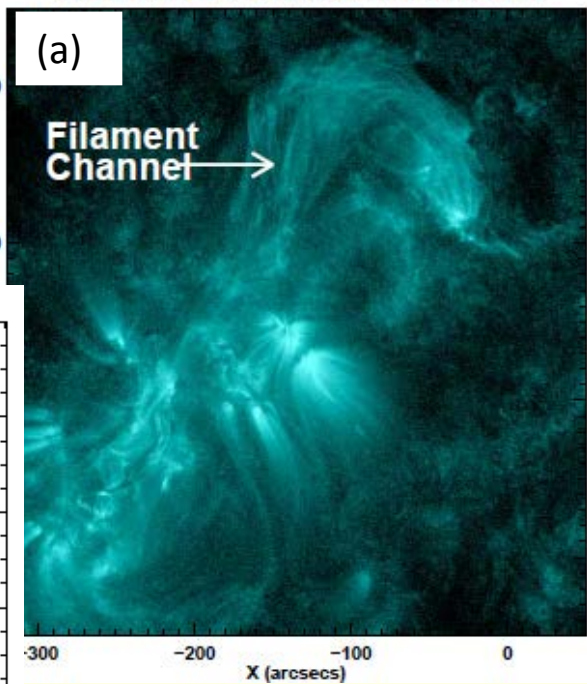


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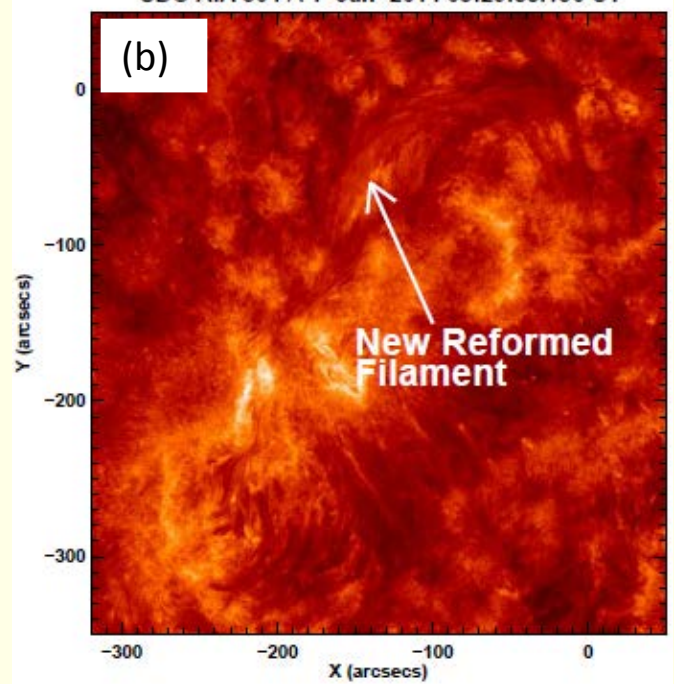


Reformation of Filament

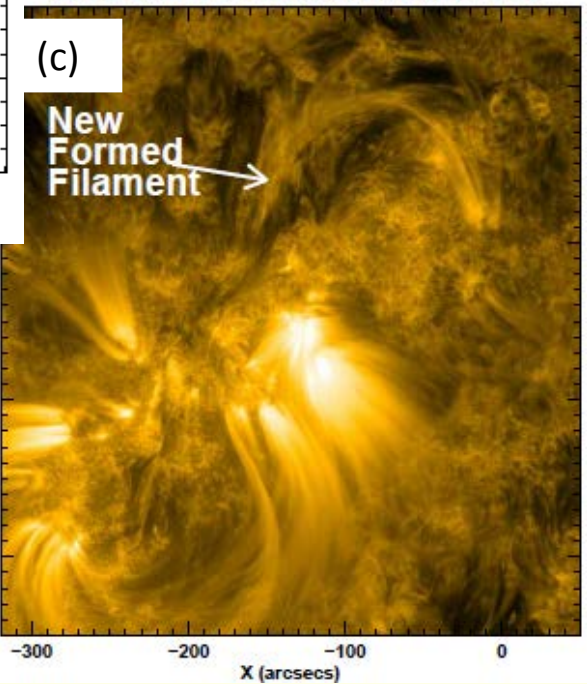
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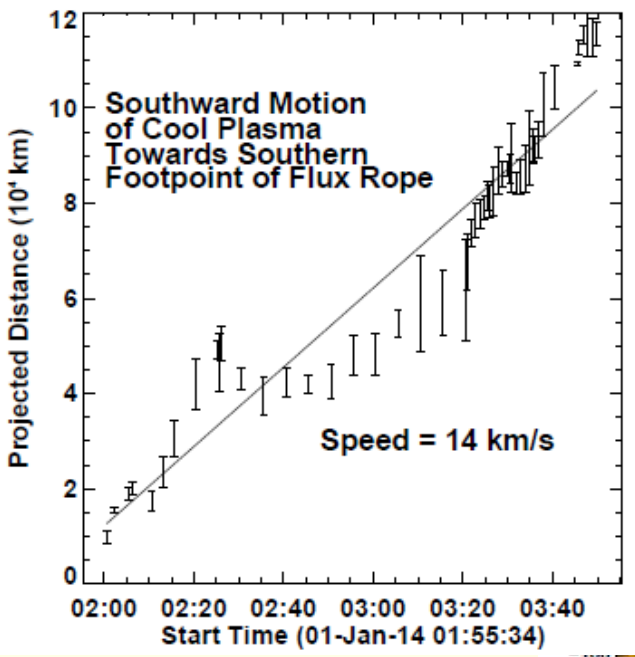
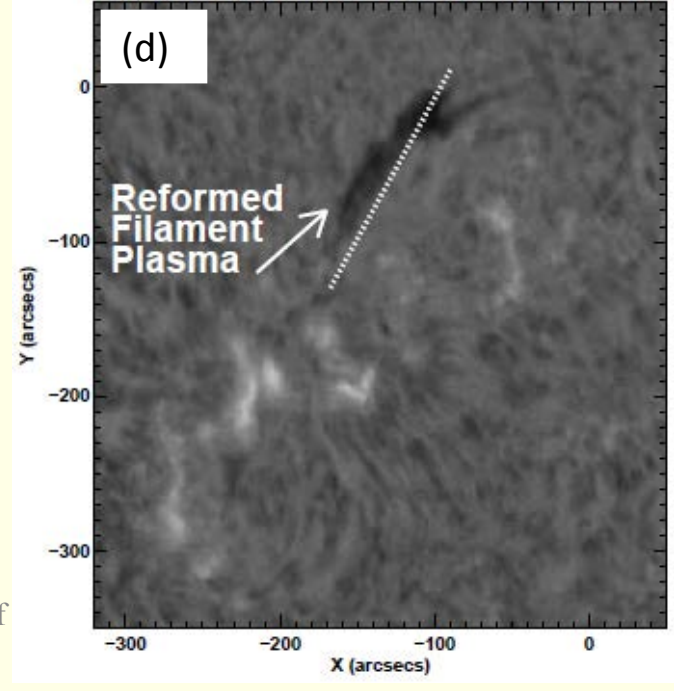
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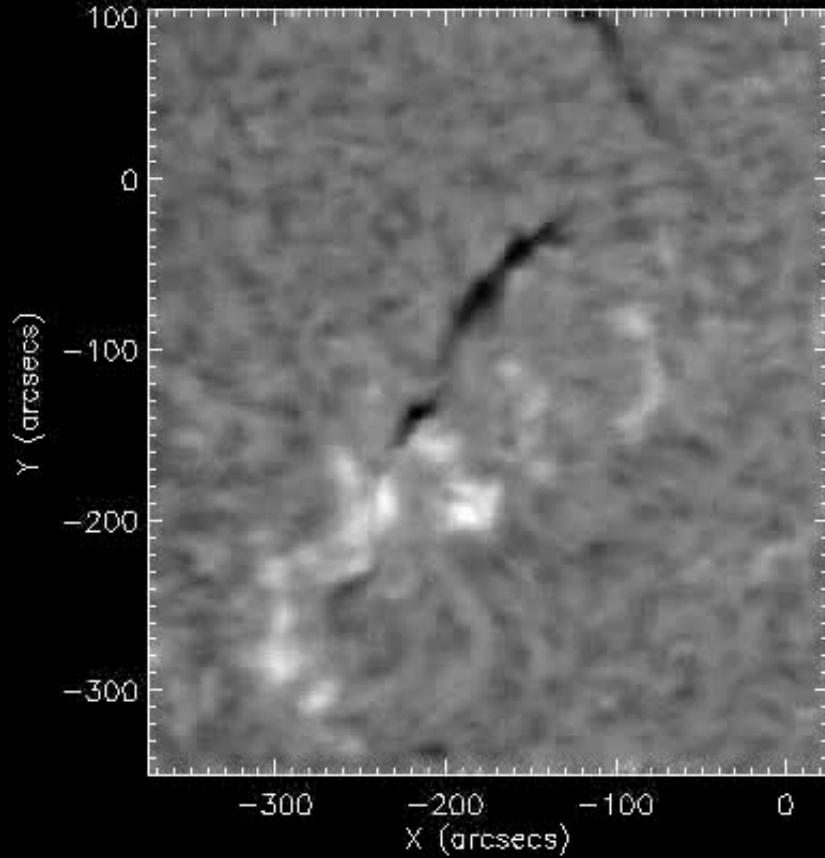
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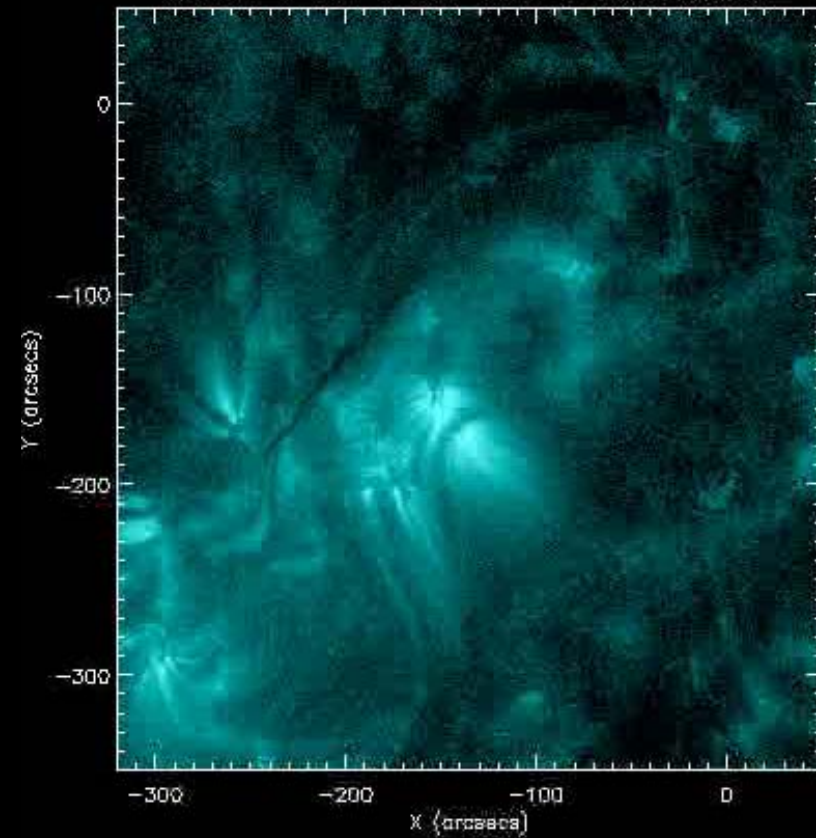
H α

AIA 131Å

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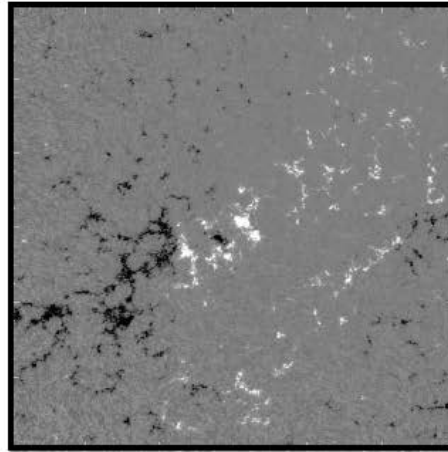
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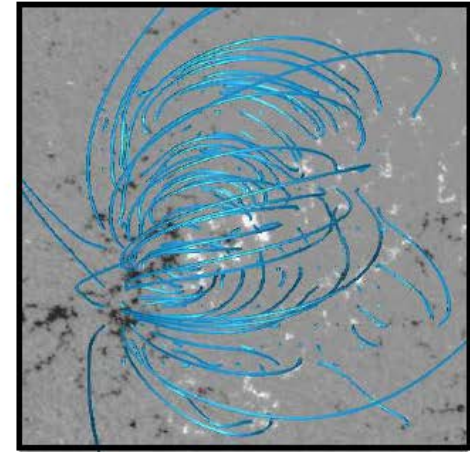
Decay Index Measurements

$$n = - \frac{\partial \log B}{\partial \log h},$$

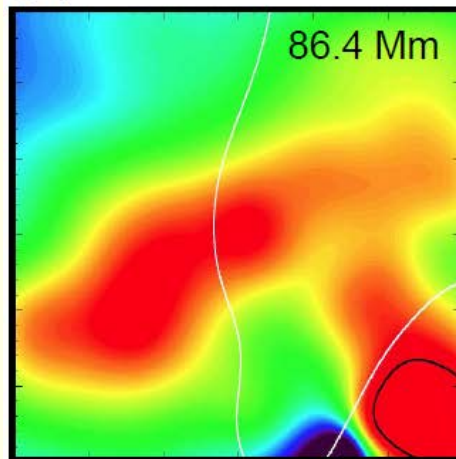
(a)



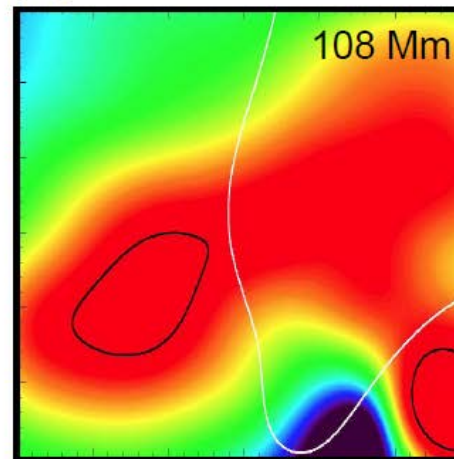
(b)



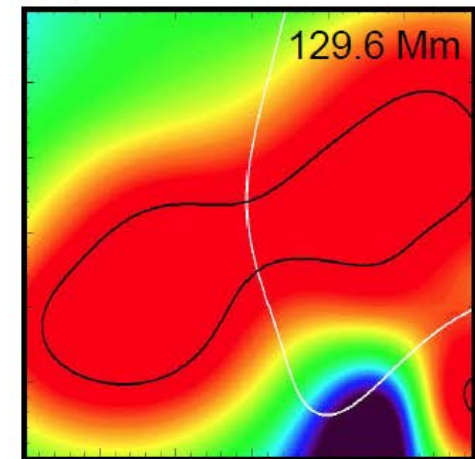
(c)



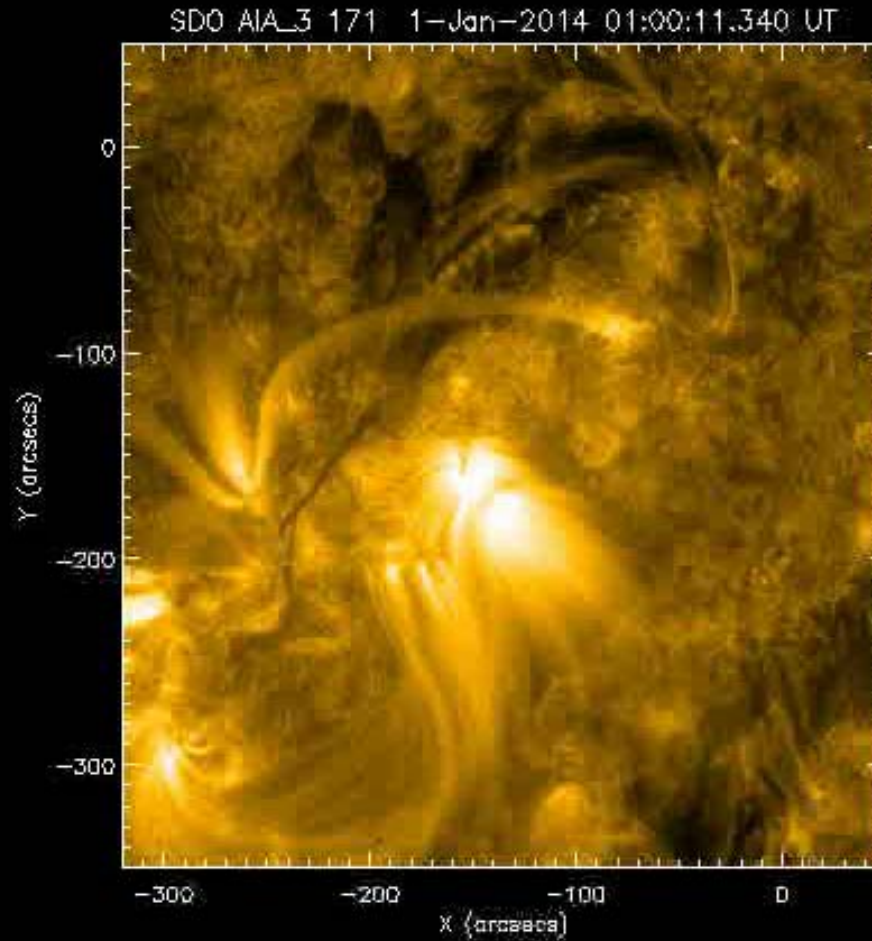
(d)



(e)

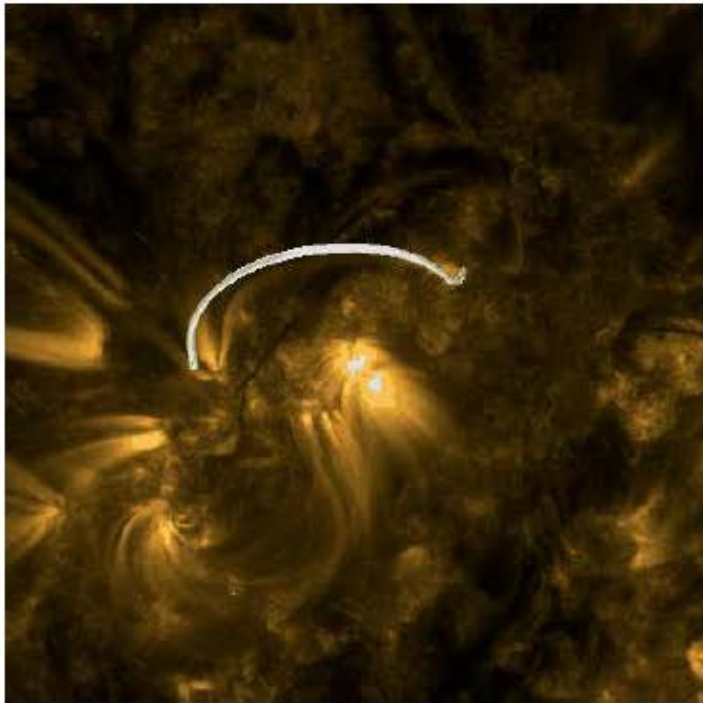


Overlaying coronal loop disturbance

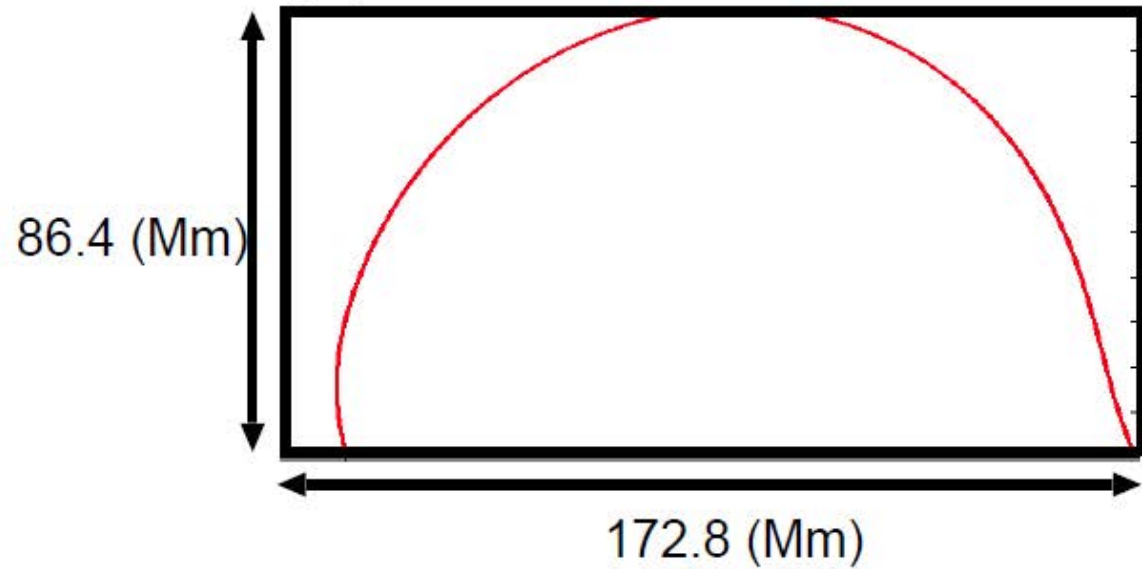


Height of coronal loop

(a)



(b)



Conclusions

1. The observations clearly show the merging of two filament channels, triggering of solar flare and the formation of compound flux rope via tether cutting magnetic reconnection scenario.
2. The compound flux rope shows an stability in the corona because it does not reached at a height where the decay index is greater then 1.5, which makes it stable against the torus instability.

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FORMATION OF A COMPOUND FLUX ROPE BY THE MERGING OF TWO FILAMENT CHANNELS, THE ASSOCIATED DYNAMICS, AND ITS STABILITY

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धन्यवाद
Thank you