

What I have learned from the 13th RHESSI Workshop

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1. Instrumentation & software

2. Scientific Topics:

(1) Flares

(2) Filament Eruptions

RHESSI Update (Krucker)

Funded till 2018

Weakness: modeling

Anneal: two months in 2014 and after

Spacecraft Status (Fivian)

Altitude: 534 * 517 km

Re-entry: 2018 (2023)

***UV + OC (over current) protections are off now
-> more noise***

2013 Nov, CPU reset. Use data with caution.

Detector Status (Shih)

Energy resolution: 10 keV FWHM ('drm_mod')

G6 excluded from now for spectrum

Use G3 as reference of pile-up effect. G3 is less affected by pile-up, because it is not sensitive. But when really doing spectral analysis, exclude G3.

G2 & G7 may have energy resolution problem. So, use G1, 4, 5, 8, 9 individually. The results tell the uncertainties.

Use multiple RMCs for imaging.

Usually no pile-up >50 keV

Pile-up happens at $2 * \text{Max}(\text{counts})$ of energy, say 10 keV

RHESSI Software Status (Shwarts)

13 year---88,000 flares observed (imaged).

'atest' folder will be removed. Update carefully!!!

Mercury orbiting SAX -> very good HXR spectra since 2004

RHESSI Nugget Highlight (Hudson)

HMI nugget in 2014

RHESSI in 2005. Biweekly

EIS. 2010

1. HINODE (Watanabe):

2011 Jan to 2013 Aug, 37 big events:

13 WL

24 normal

(There is an X-class flare has not WL/HMI)

2. Gan:

Filtergrams tend to give higher flare contrasts >100%

Spectrograms tend to give lower flare contrasts < 10%

3. Kerr and Fletcher 2014:

Total WL power dominates emission in flares.

Questions about WL flares:

1. Formation height:

- (1) disk center observations**
- (2) limb events**

2. Heating Mechanisms:

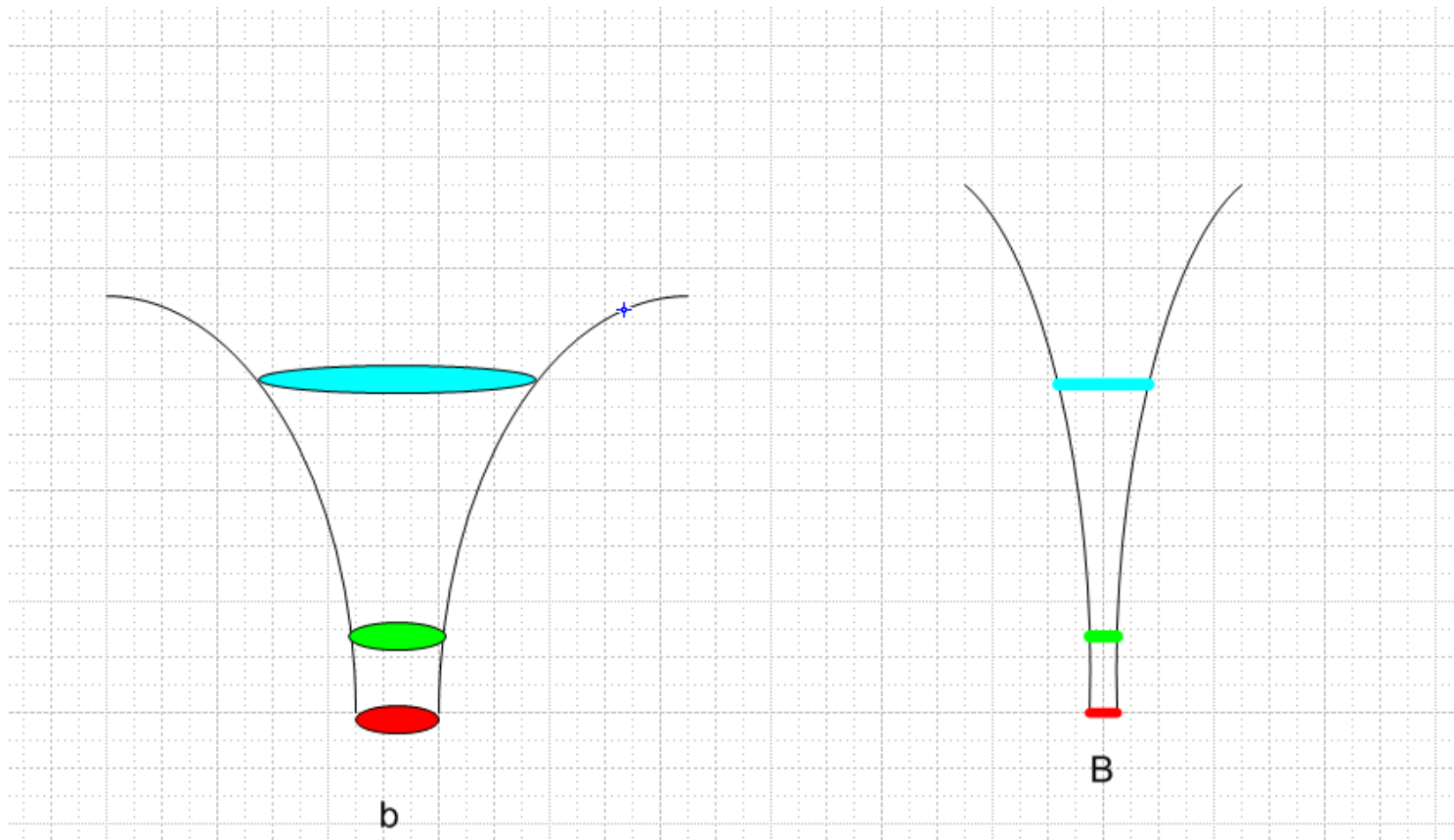
related to the 1st question, low height → multiple mechanisms
high formation → direct heating modeling

3. Optical thin or thick?

This is now becoming a open questions.
Hugh Hudson → thick
Joel Allred → thin
Weiquan Gan → thick

Questions about WL flares:

1. Formation height:



Questions about WL flares:

1. Formation height:

Different WL should have different formation heights

*Xu et al., 2004, 2006, 2010, 2012 → < 500 km (NIR, visible 5000 & G)
converging rate $[d(s)/d(h)]^* \sim 2$*

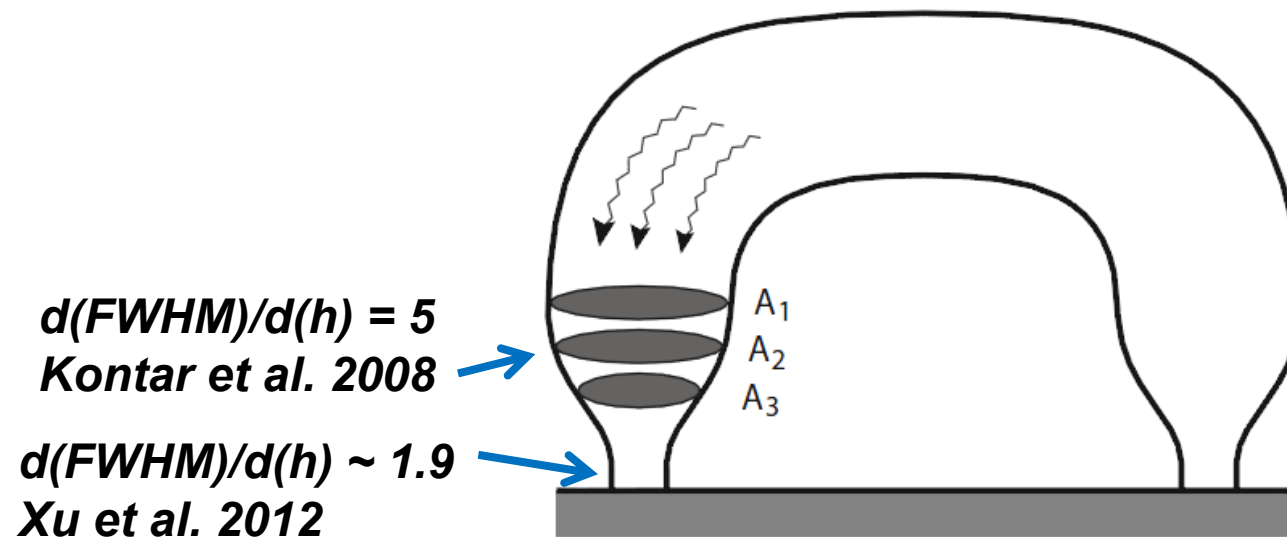
*Kontar et al., 2008, 2011 → >1000 km (HMI/SDO 6173)
> 200 keV
converging rate ~ 5*

*Martinez Oliveros et al., 2012 → 305 ± 170 km (HMI/SDO 6173)
30 ~ 80 keV*

Questions about WL flares:

1. Formation height:

Kontar et al., 2008



Questions about WL flares:

2. Heating Mechanisms:

***related to the 1st question, low height → multiple mechanisms
high formation → direct heating modeling***

New models needed, not too complicated ones...

New observations need, wide range spectra...

Questions about WL flares:

3. Optical thin or thick?

This is now becoming an open question:

Hugh Hudson → thick

Joel Allred → thin

Weiquan Gan → thick

Center-to-limb variation: Neidig & Wiborg 1993 Solphys 144, 169

not optically thin

19 events, uncertainties...

Questions about WL flares:

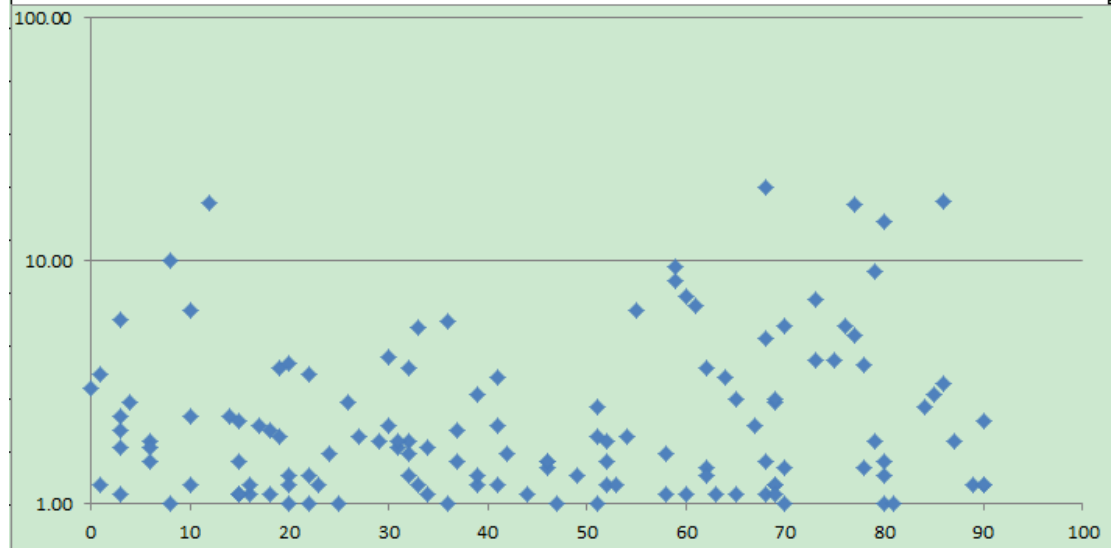
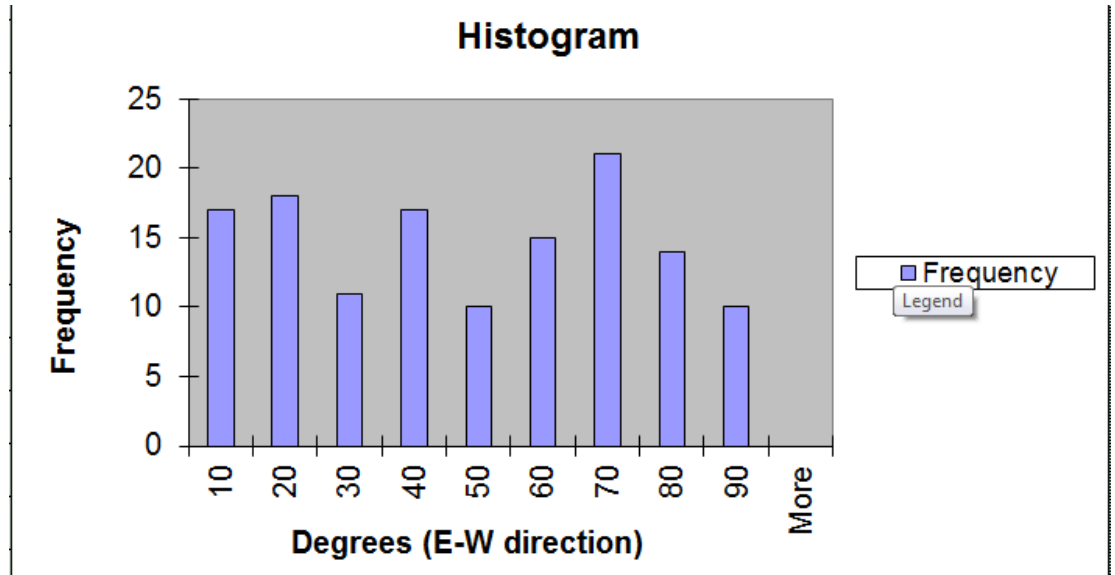
3. Optical thin or thick?

1997-Nov-04

~

2011-Nov-03

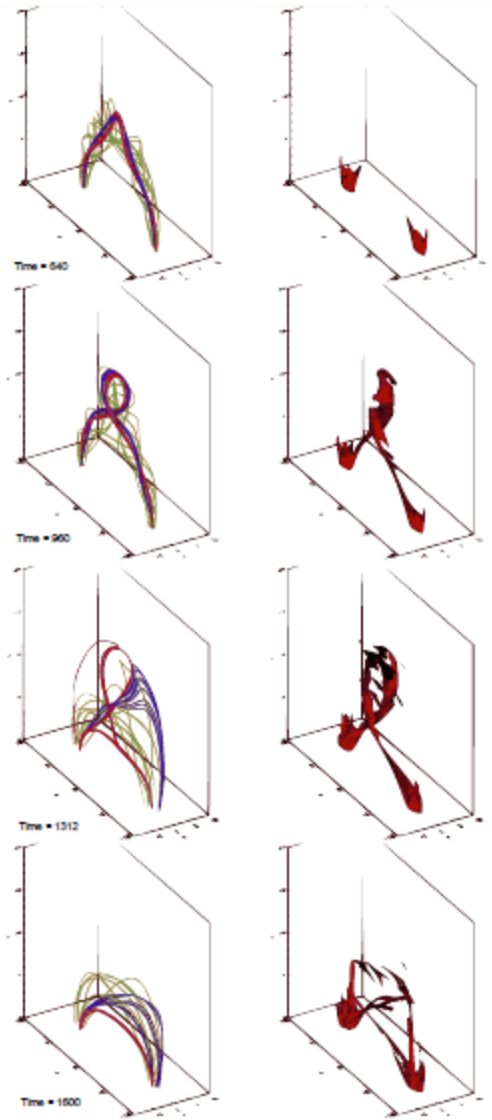
134 events $\geq X1$



Browning:

Kink instability cause eruption, very like the one we see in H α

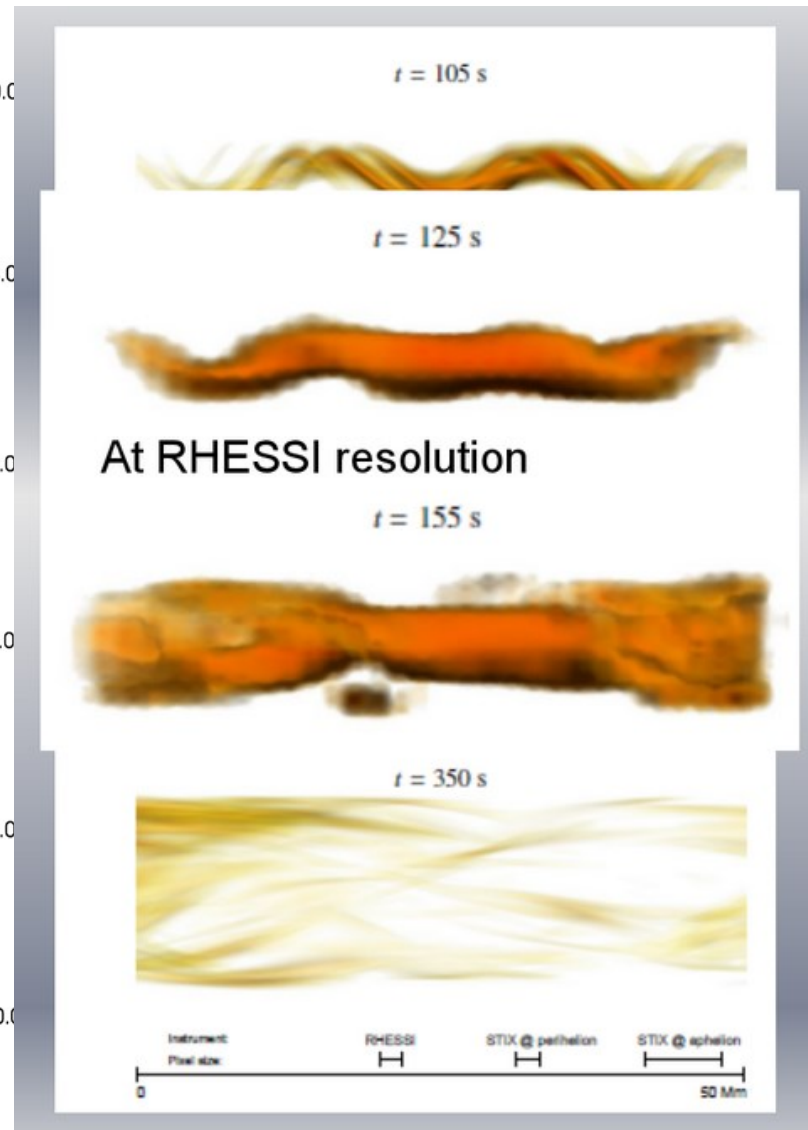
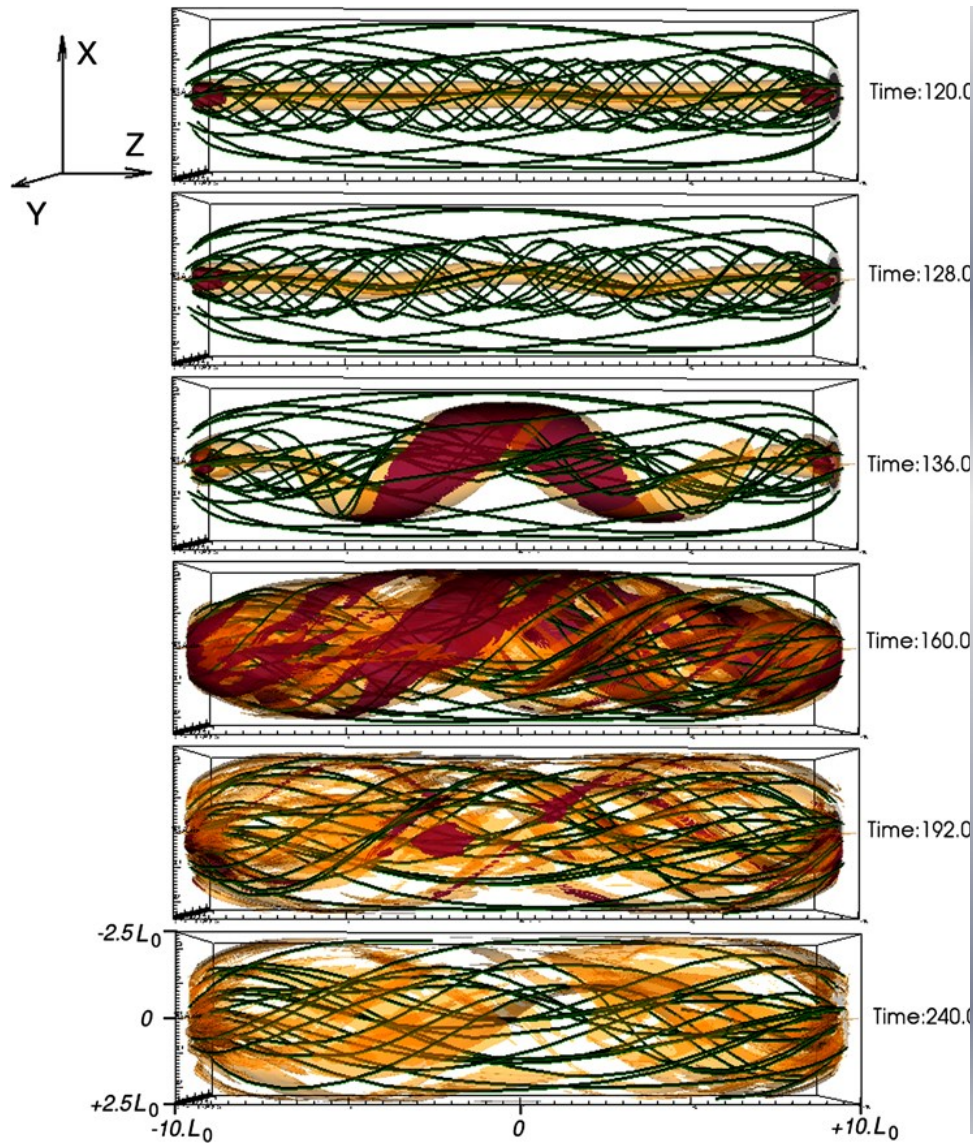
A&A 5



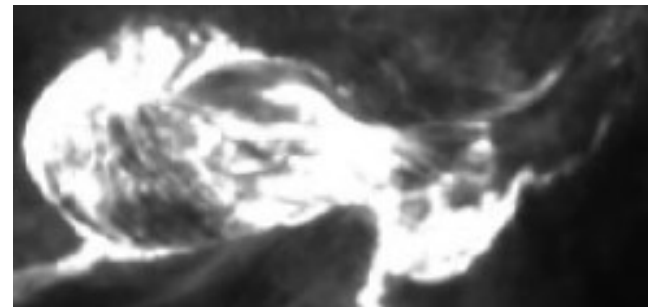
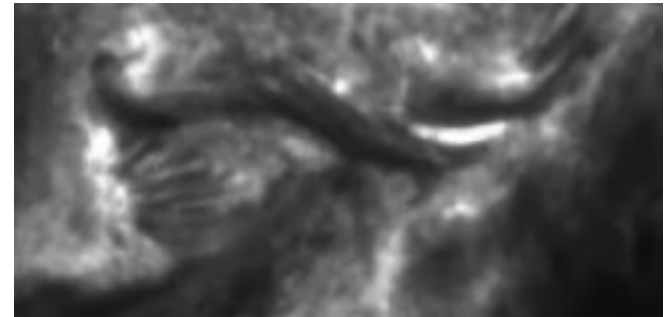
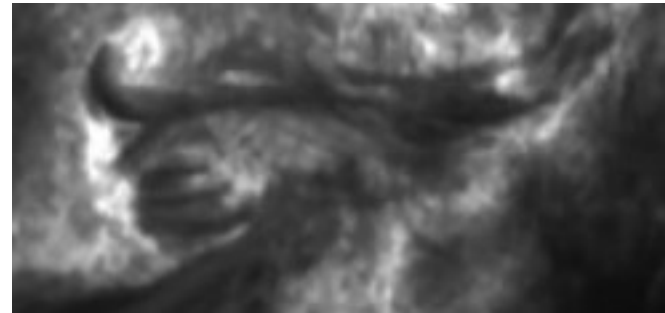
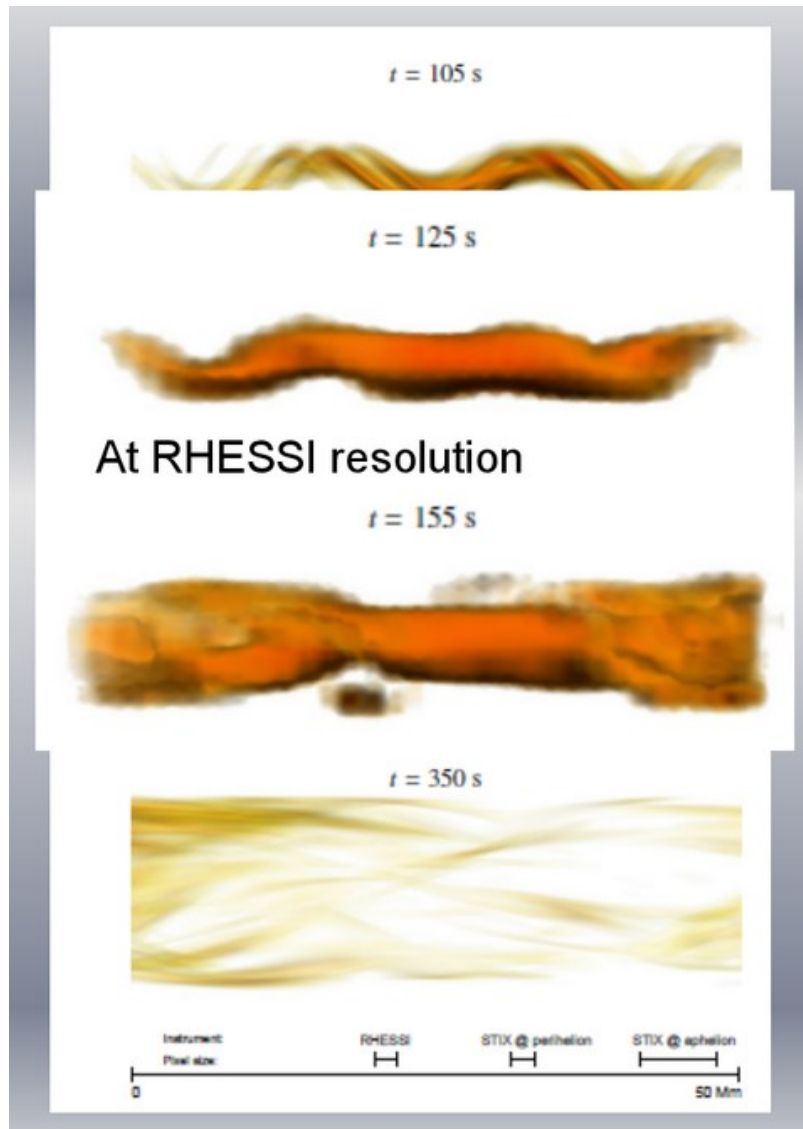
Left → magnetic field lines

Right → current density in iso-surfaces

Filament eruption



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EUV 304

Tasks:

(1) 200 flares

CME mass, use dimming

***How much mass erupted in several hours is really important.
Can Shuo provides more accurate numbers?***

(2) Calculate the total power for NIR and Visible in 2003 and compare with HXR.

(3) 6-point data from limb events

(4) HXR and WL offsets for center events depend on energy or multiple events. Answer the question of which energy band corresponding to WL. We know that in X-Y plane but has rare information about the Z direction.

(5) Statistic study of Decay index vs. E_{free} vs? Flare productivity. Add $E_{\text{free}}/\text{area}$?

Thank You!

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