



# HELCATS

## WP 4 – Task 4.1

### Comparing to Coronal Sources

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HELCATS Kick-Off Meeting, 14-15 May 2014, RAL, Didcot, UK





# Task 4.1 - Objectives

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## Task 4.1: Comparing to coronal sources (Task leader: UGOE)

- Identification of the low coronal and photospheric source region signatures of the CMEs in the STEREO/HI catalogue (WP2 and 3):  
flares
  - filaments, prominences
  - EUV post-eruption arcades
  - Coronal dimmings
  - EUV waves
  - Bipolar regions
- The modelling methods used on HI data (in WP3) will produce windows for CME launch time and position on the solar disk
- Instruments used: STEREO/EUVI, SOHO/EIT+MDI, SDO/AIA+HMI, Proba2
- Role of participants: UGOE: online cataloguing of signatures with back-projections from WP3





# Task 4.1 - Objectives

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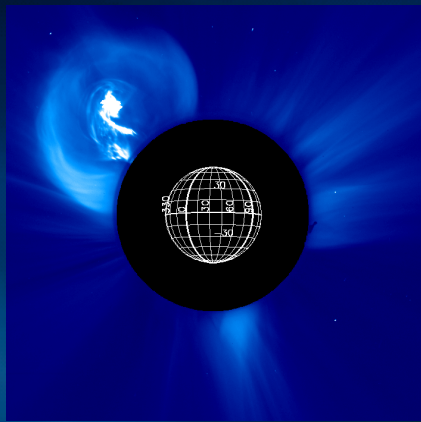
## Task 4.1: Comparing to coronal sources (Task leader: UGOE)

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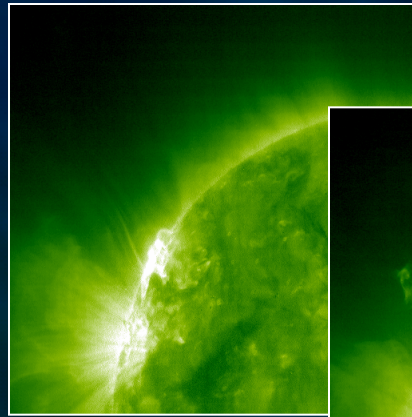


# Evolution and Morphology of E-Limb CMEs

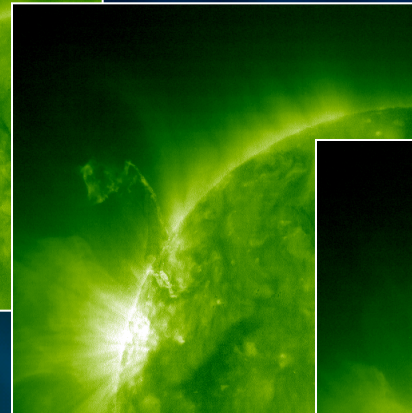
SOHO/EIT/  
LASCO



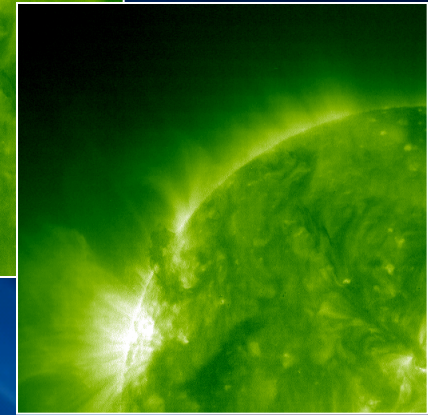
2002/01/04 10:06 UT



2002/01/04 11:01 UT

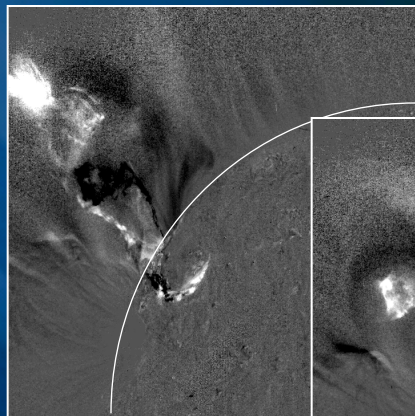


2002/01/04 9:24 UT

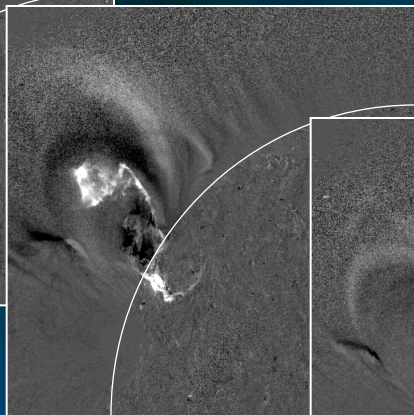


2002/01/04 8:48 UT

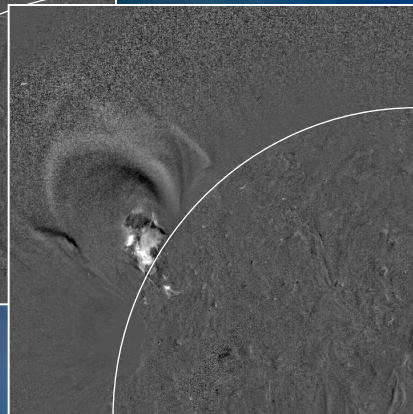
time



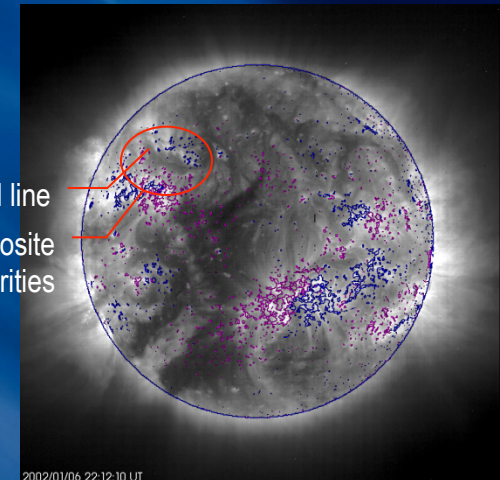
2002/01/04 9:36 UT



2002/01/04 9:24 UT



2002/01/04 9:12 UT

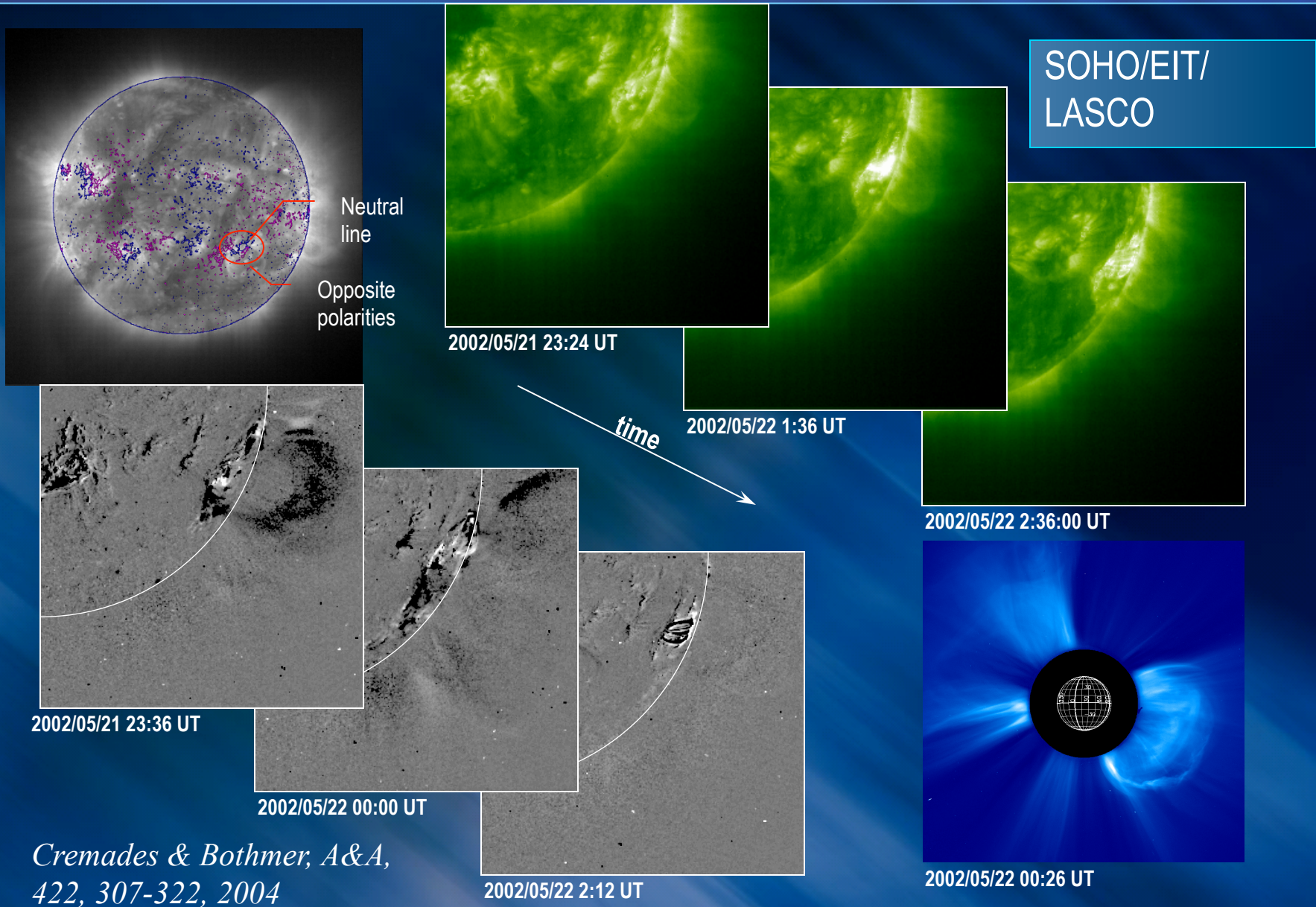


Neutral line  
Opposite polarities

2002/01/06 22:12:10 UT

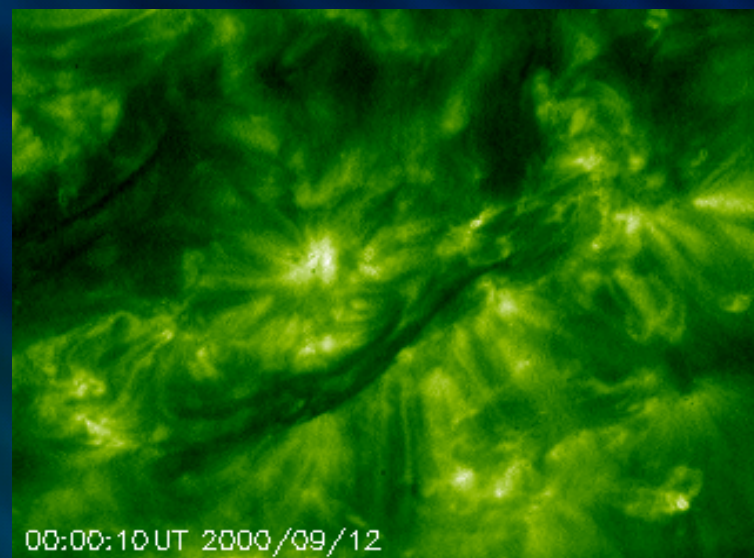
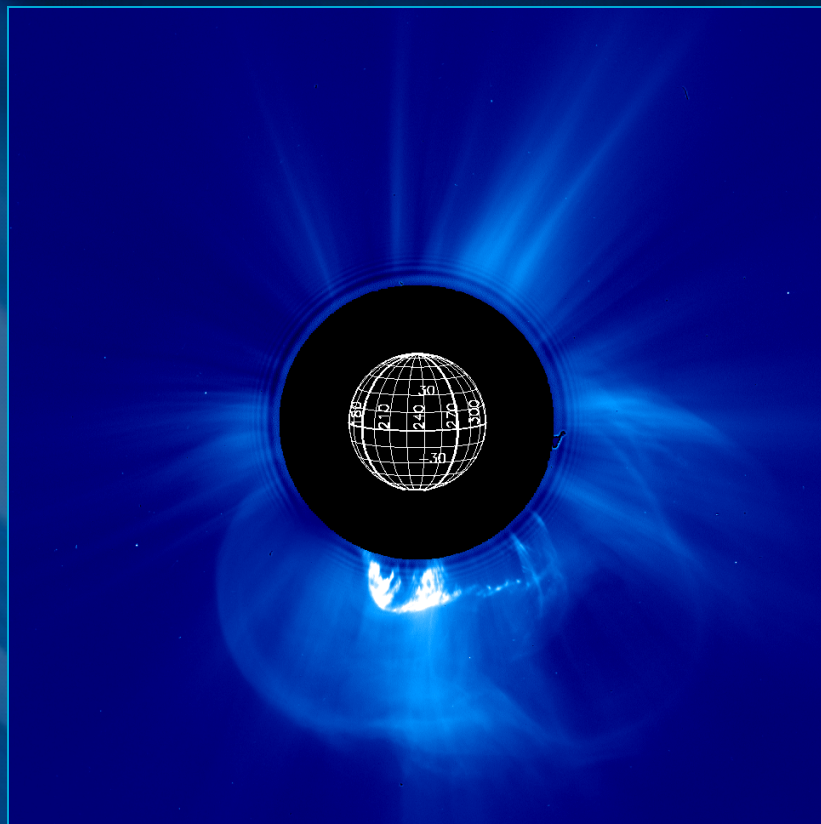
*Cremades & Bothmer, A&A,  
422, 307-322, 2004*

# Evolution and Morphology of W-Limb CMEs

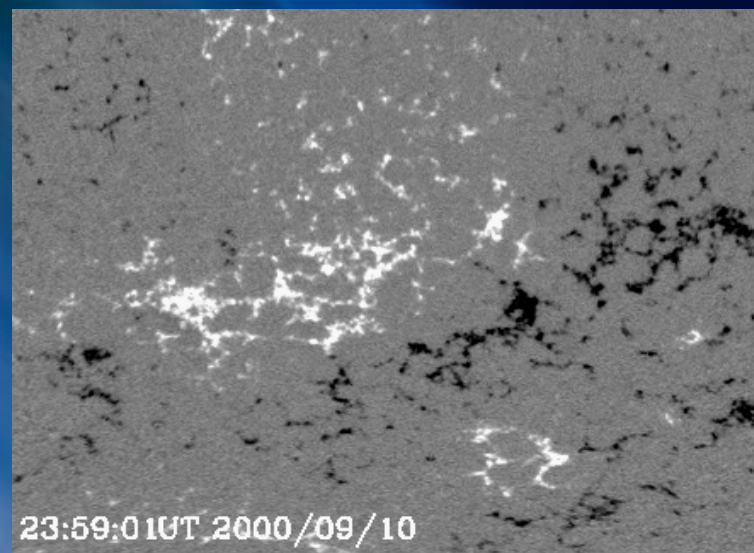


*Cremades & Bothmer, A&A,  
422, 307-322, 2004*

# Filaments, Arcades, CMEs and Variation of the Photospheric Magnetic Flux in the Source Region



EIT  
195 Å

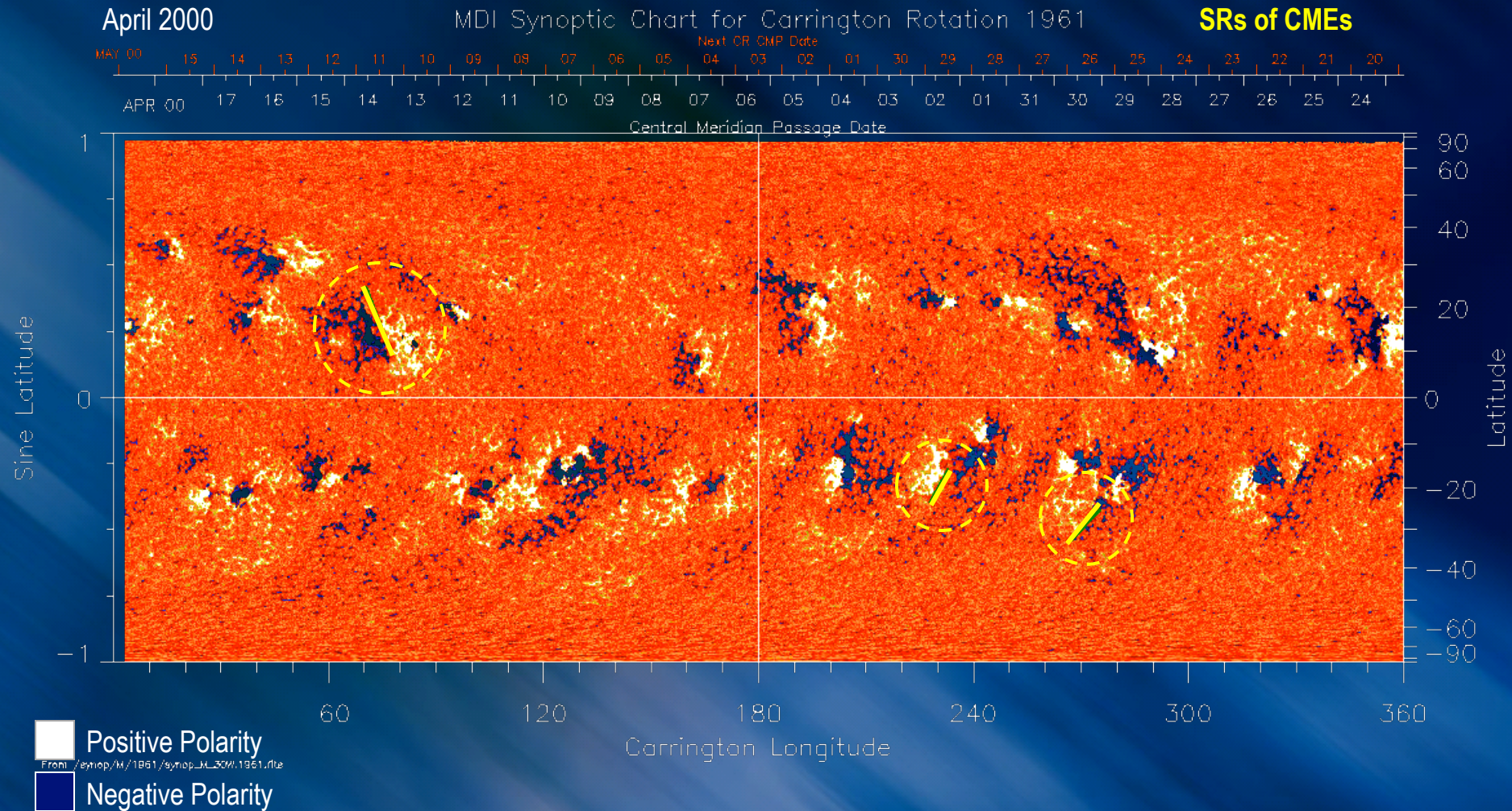


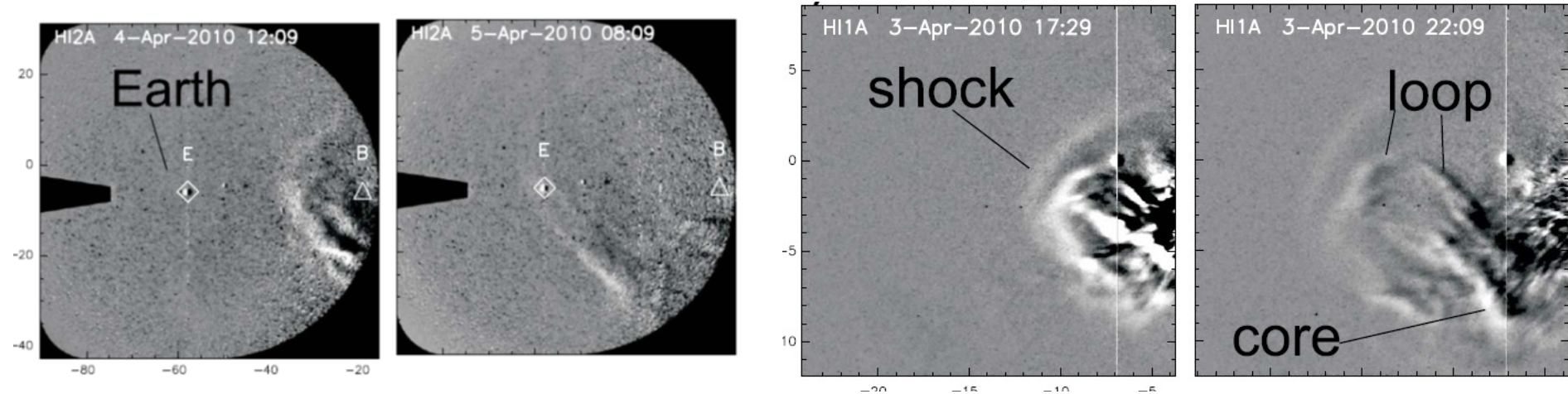
MDI

A detailed study has started to investigate the evolution of the photospheric flux in the source regions of CMEs (*Tripathi, Bothmer, Cremades, A&A, 422, 307-322, 2004*).

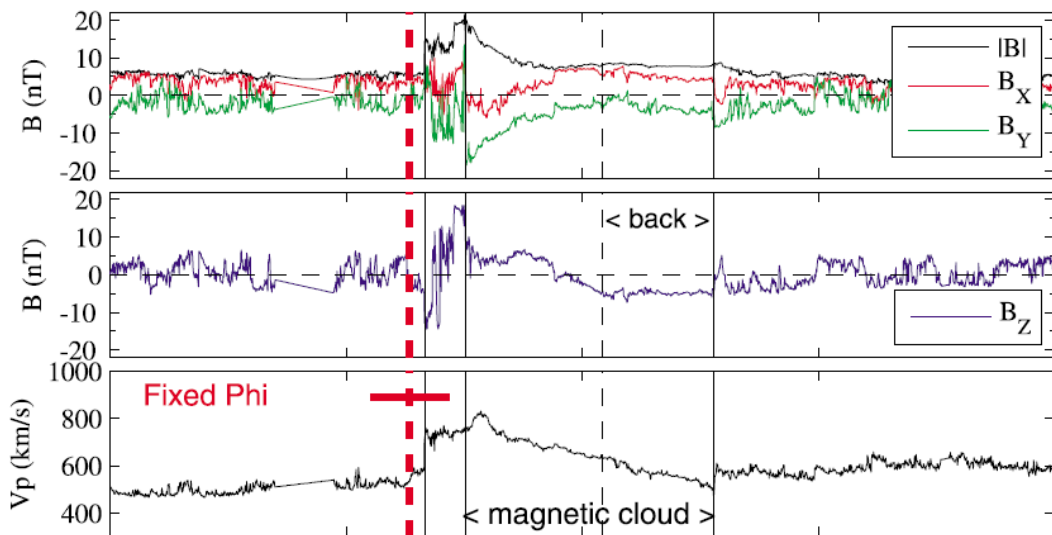
*Bothmer & Zhukov, 2007*

# Bipolar Regions as CME Source Regions





Wind SWE / MFI 4-7 April 2010

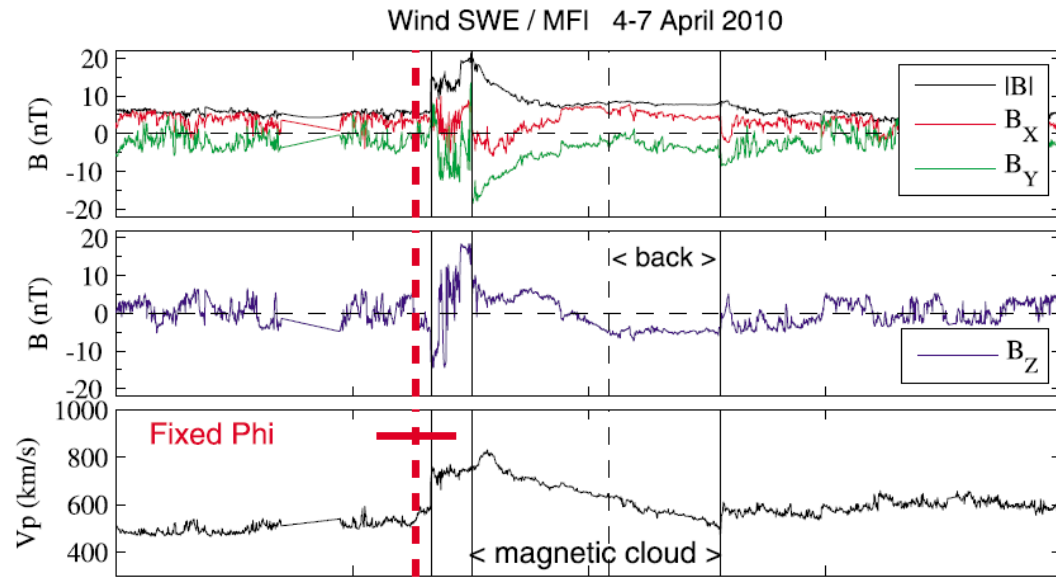
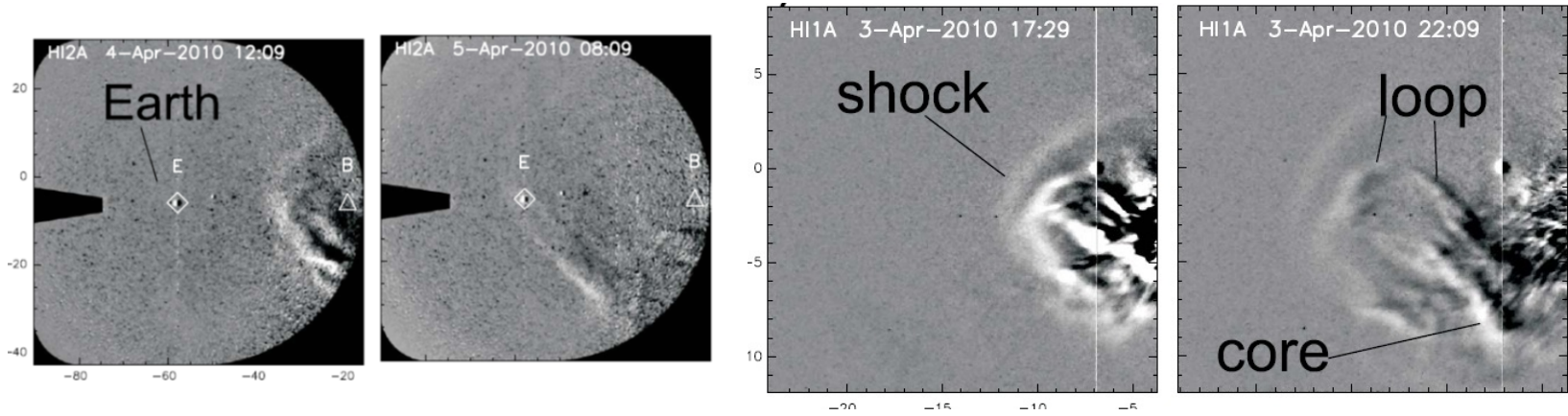


Möstl et al., 2010





# SECCHI HI A observations and Wind measurements

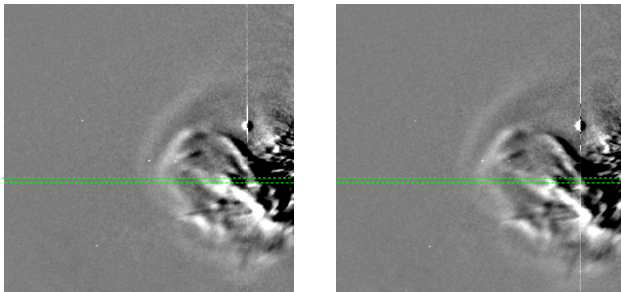


Möstl et al., 2010

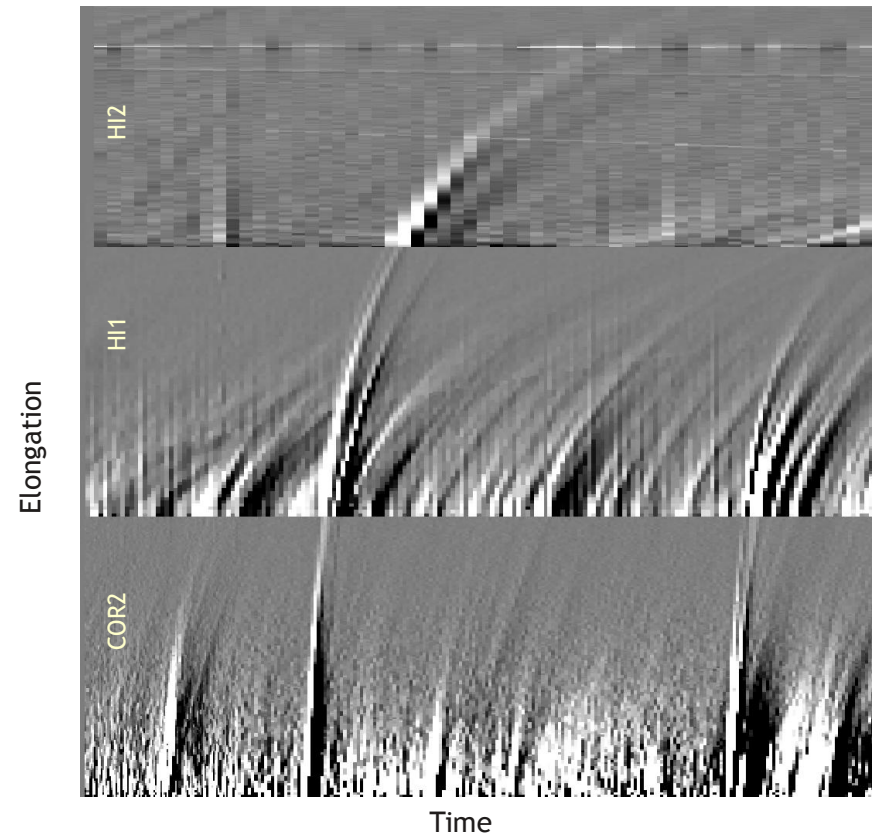


# Time-Elongation Maps

- Built stacking slices of difference images. Solar wind transients appear as white tracks in the time elongation plots (jmaps)



- Manual selection of points along the tracks yields the temporal variation in elongation angle of the feature's front

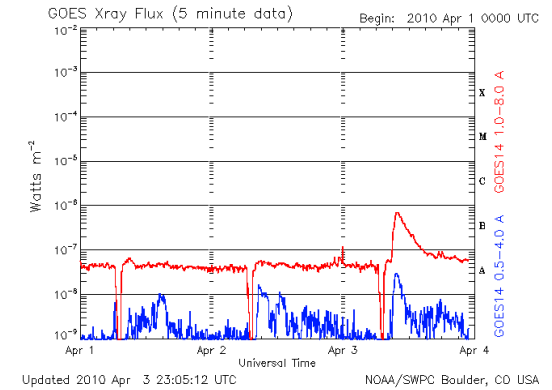
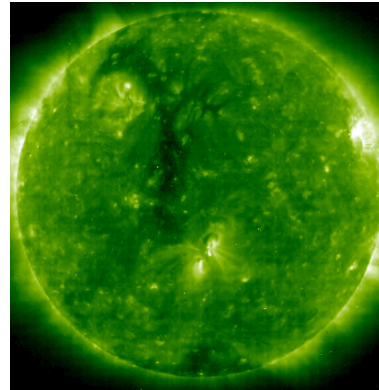
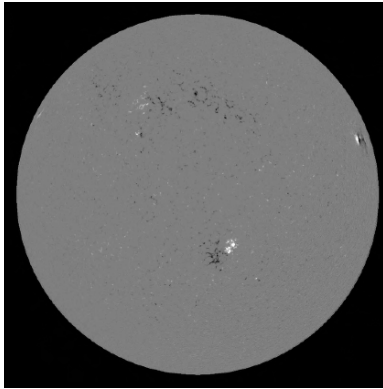


Courtesy: L. Volpes, J. Davies

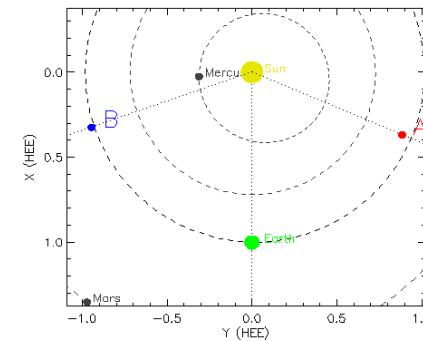
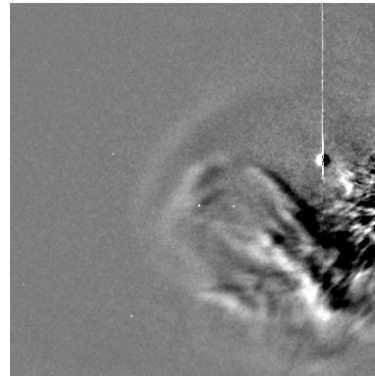
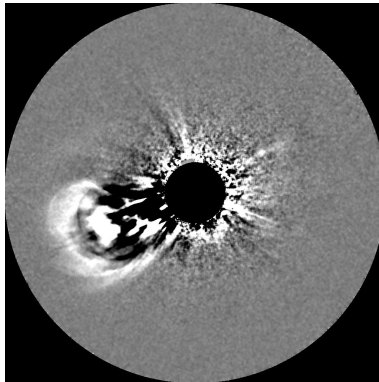


# 03-04.2010 CME

- Originated from NOAA AR11059 (S23W05) and associated to a B7.4 flare detected by GOES at 09:04 UT



- Detected by the STEREO A and B coronagraphs and heliospheric imagers

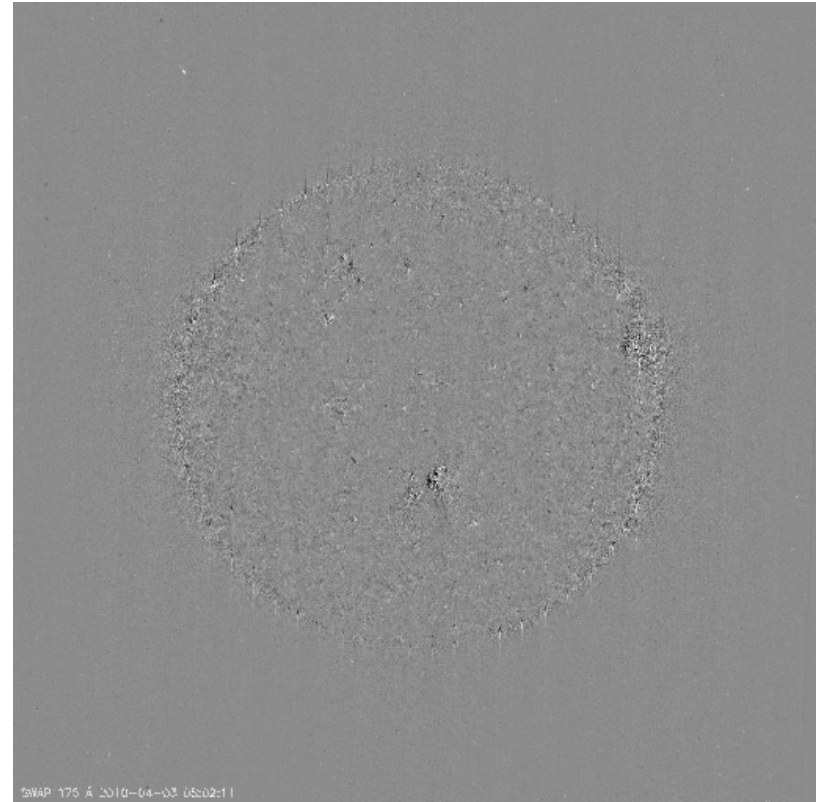
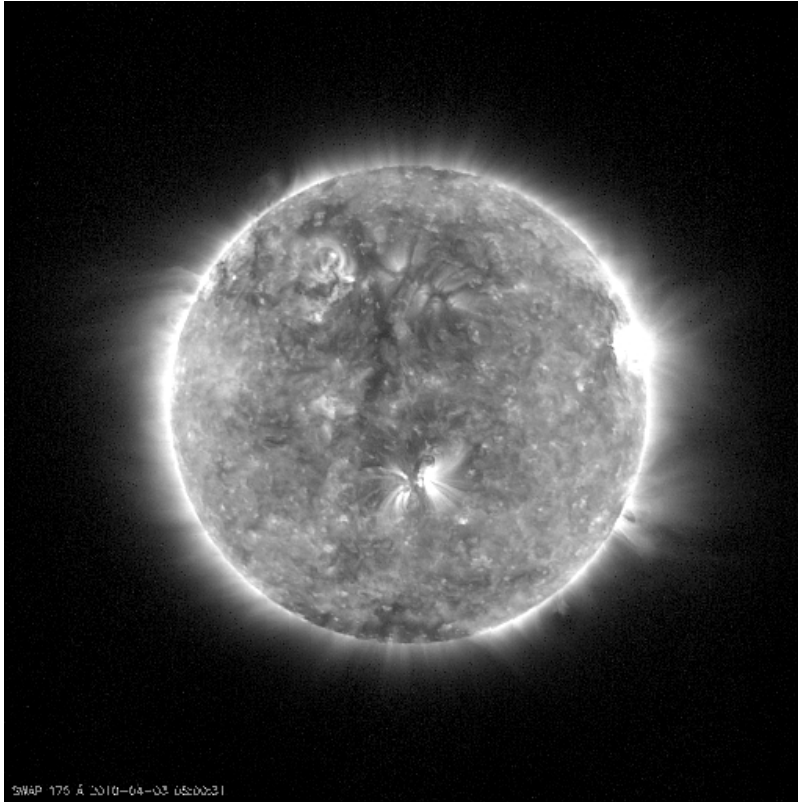


Courtesy: L. Volpes



# Proba2 Observations of CME Onset

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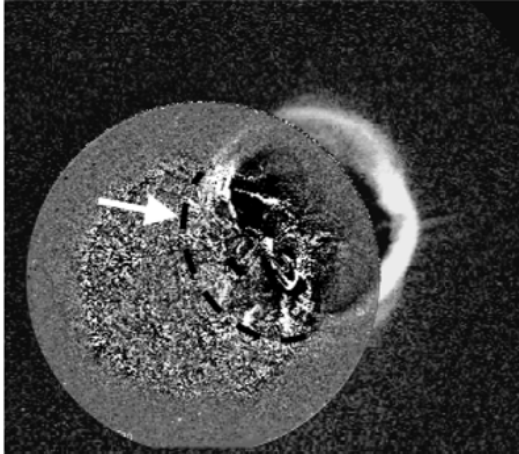


# Coronal Waves

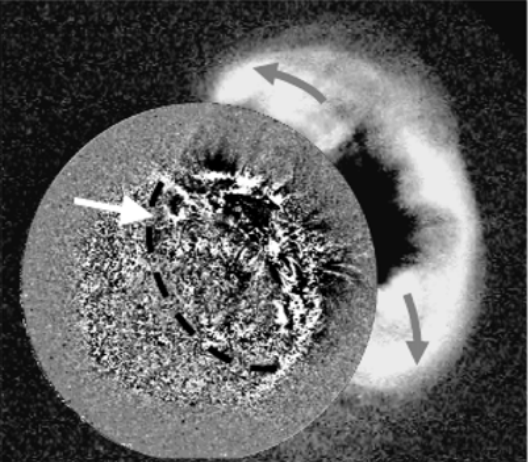
21 March 2011

Not in event list

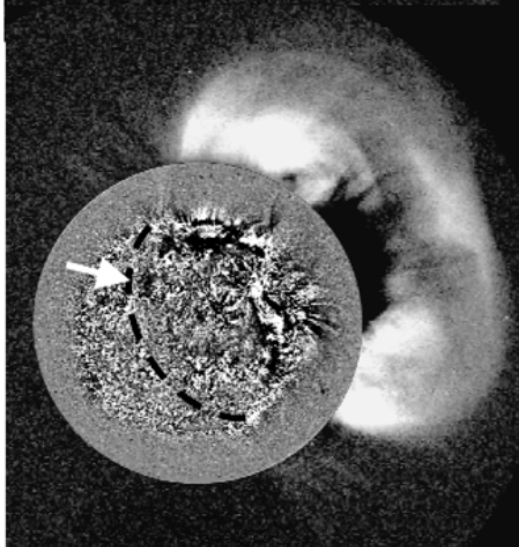
EUVI-A - COR-1A 02:20UT



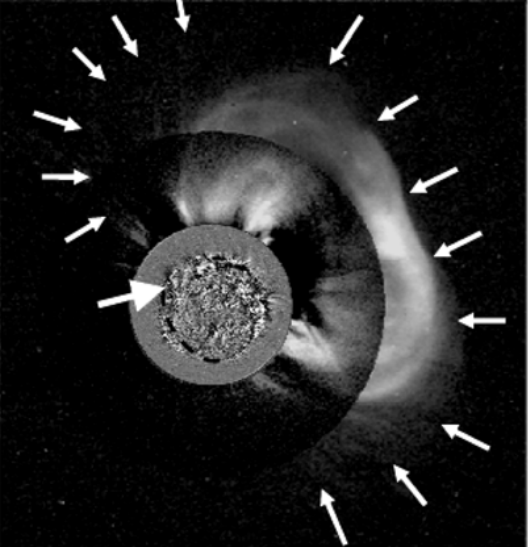
EUVI-A - COR-1A 02:30UT



EUVI-A - COR-1A 02:38UT



EUVI-A - COR-1/2A 02:54UT



Rouillard et al., 2012

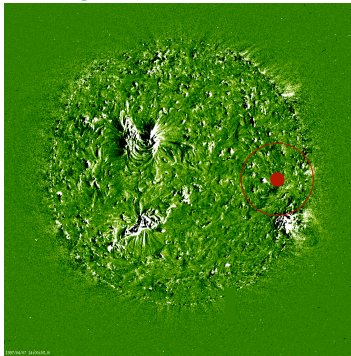




# EUV wave expansion – April 7, 1997; SOHO/EIT

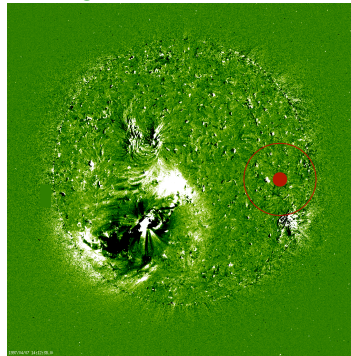
SOHO/EIT 19.5 nm

14:00 UT



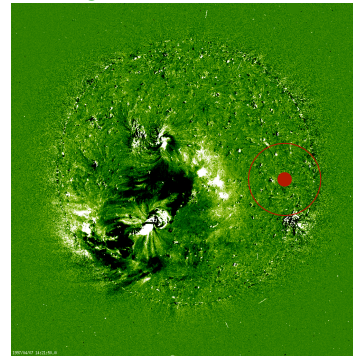
a

14:13 UT



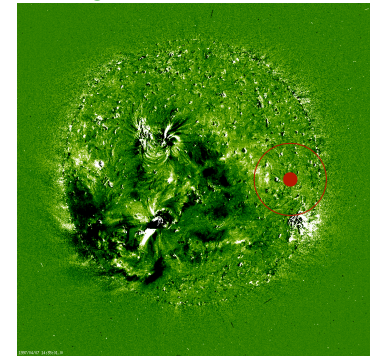
b

14:22 UT

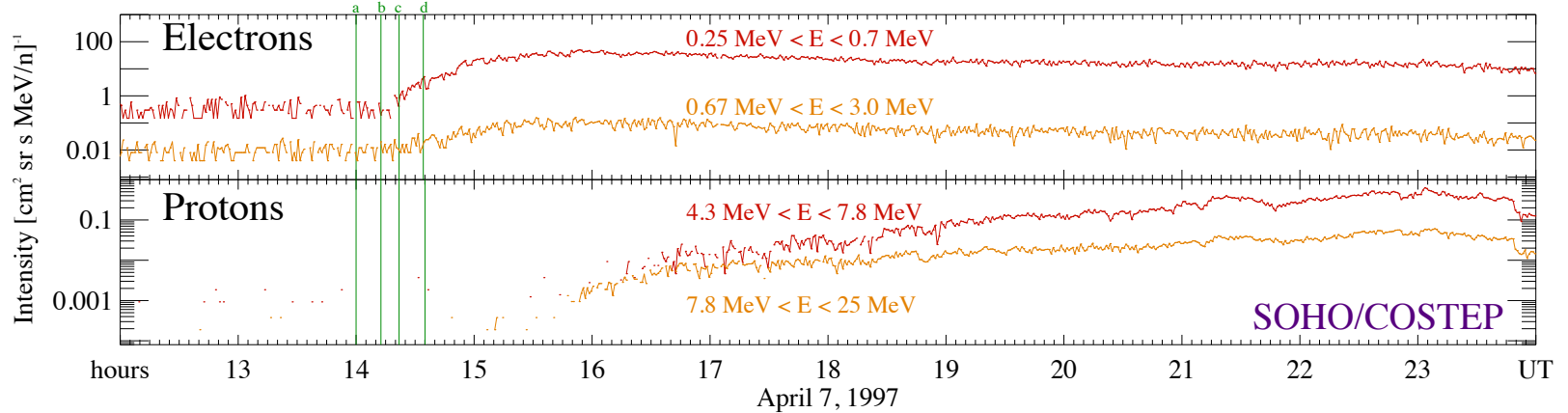


c

14:35 UT

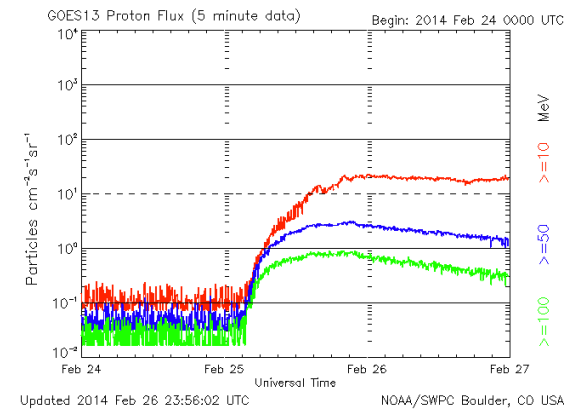
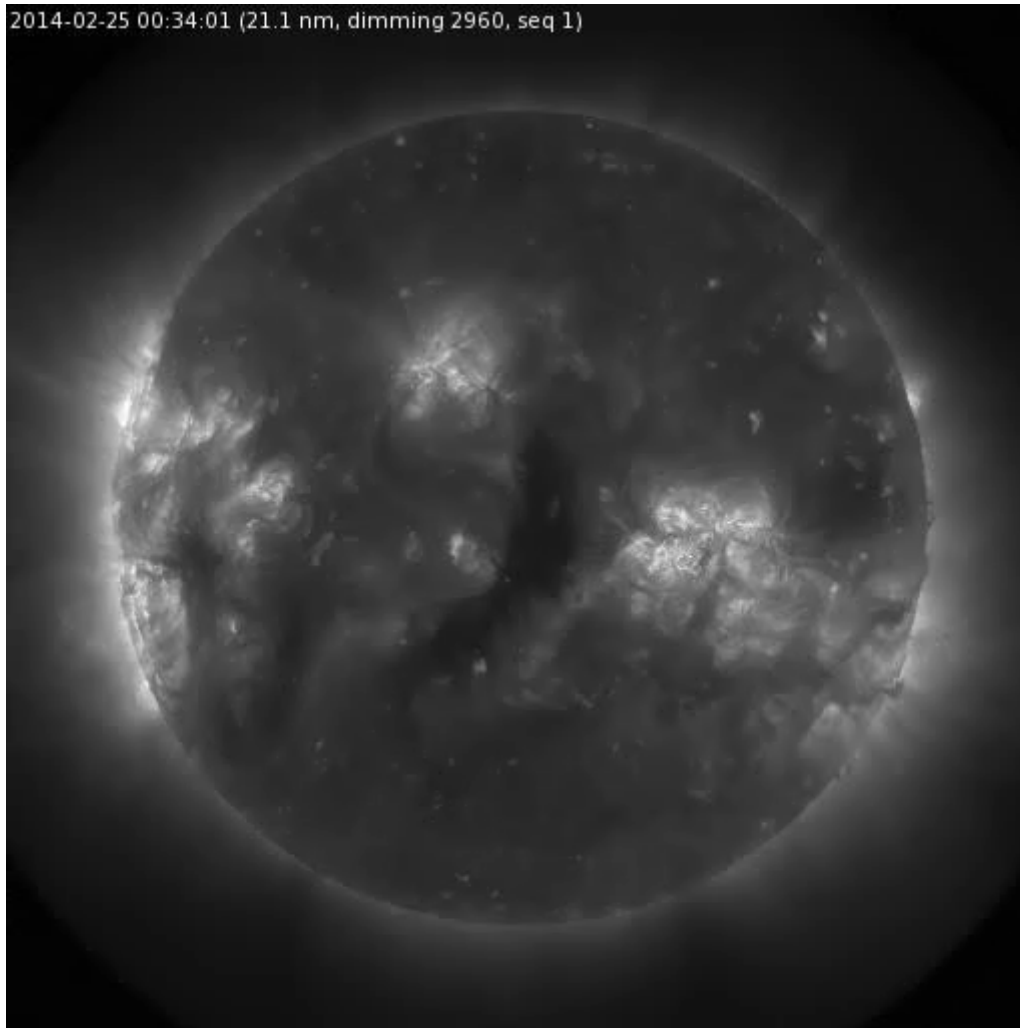


d



Bothmer et al., 1997

# Shock wave expansion – Feb 25, 2014



Courtesy: E. Kraaikamp,  
ROB, Solar Demon,  
AFFECTS