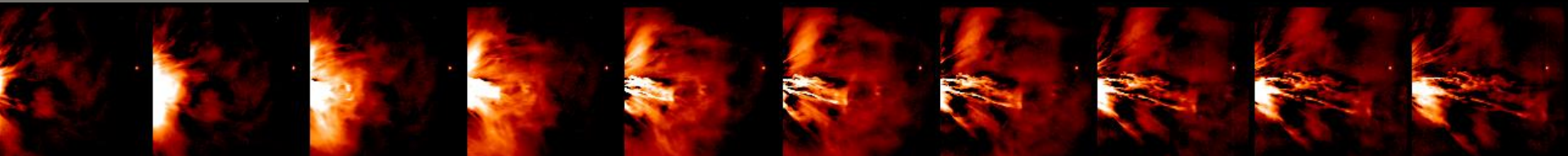




HELcats WP2: Producing a definitive catalogue of CMEs imaged by STEREO/HI

INTRODUCTION

Jackie Davies

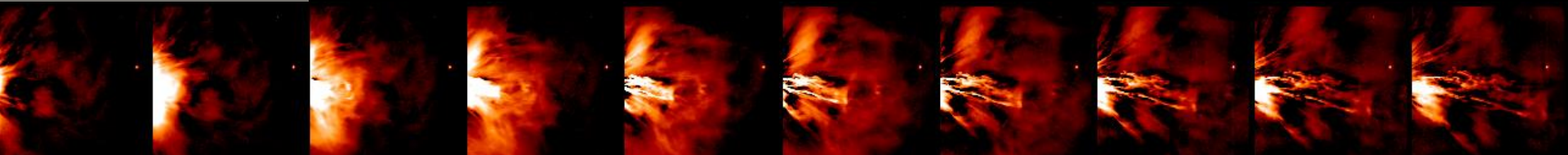


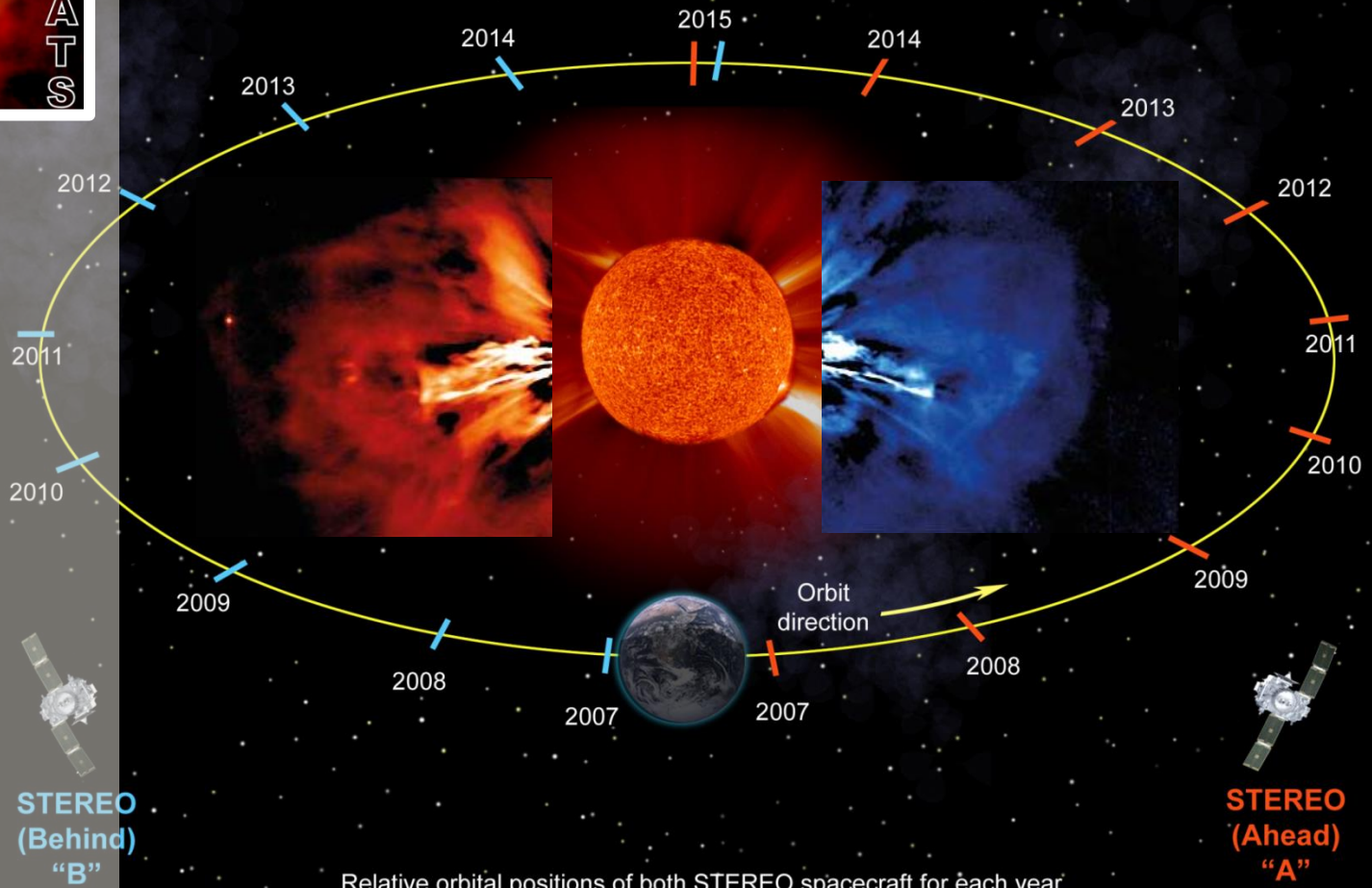


STEREO: Solar TERrestrial RElations Observatory

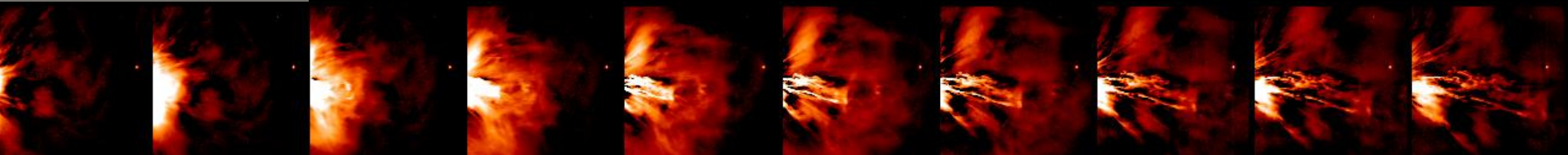
The scientific objectives of NASA's twin-spacecraft STEREO mission, launched in 2006, are to:

- Understand the causes and mechanisms of CME initiation;
- Characterize the propagation of CMEs through the heliosphere;
- Discover the mechanisms and sites of energetic particle acceleration in the low corona and the interplanetary medium;
- Improve the determination of the structure of the ambient solar wind.



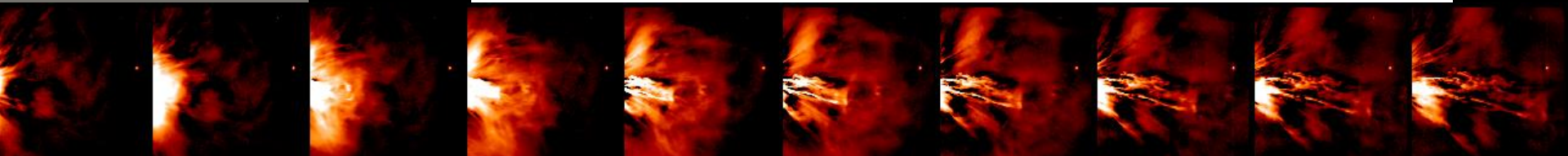
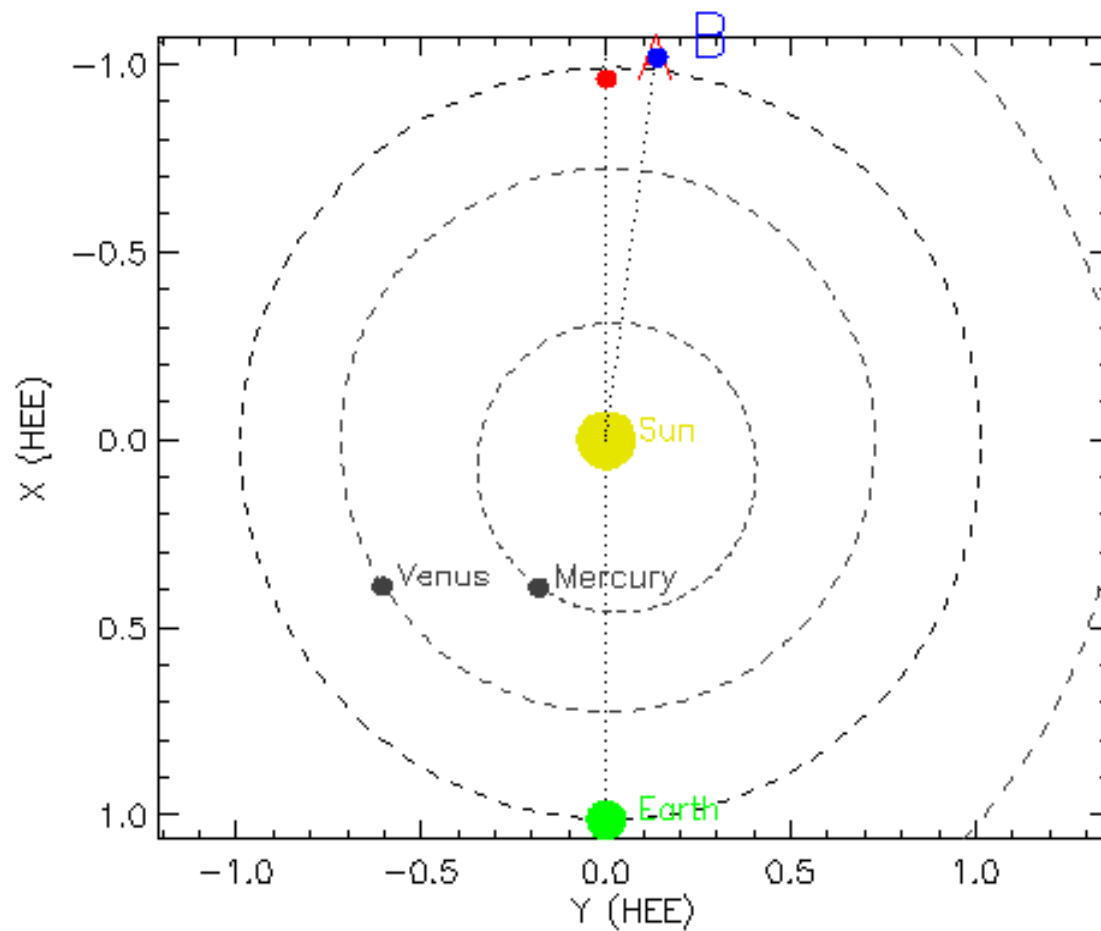


Relative orbital positions of both STEREO spacecraft for each year from June 2007 to June 2015 (Diagram not to scale)



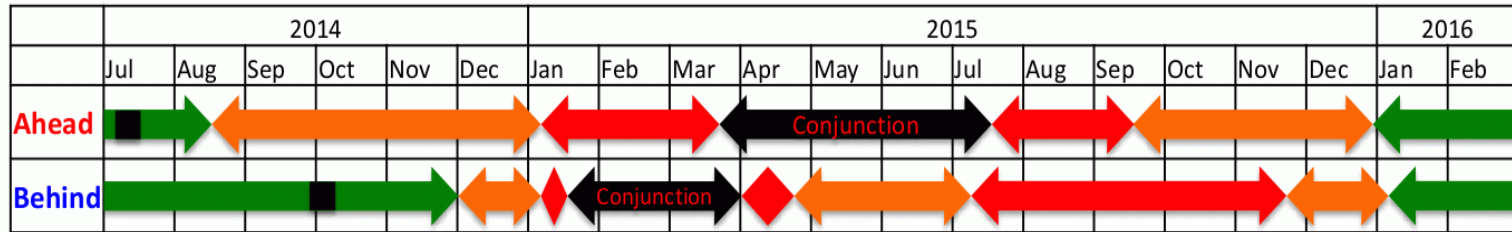


STEREO configuration: 18 May 2015



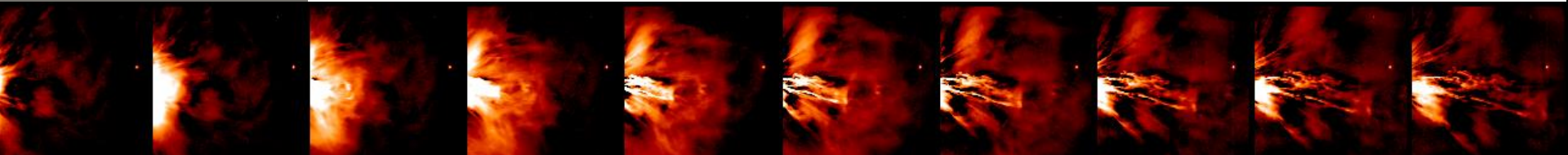


STEREO SOLAR CONJUNCTION SCHEDULE



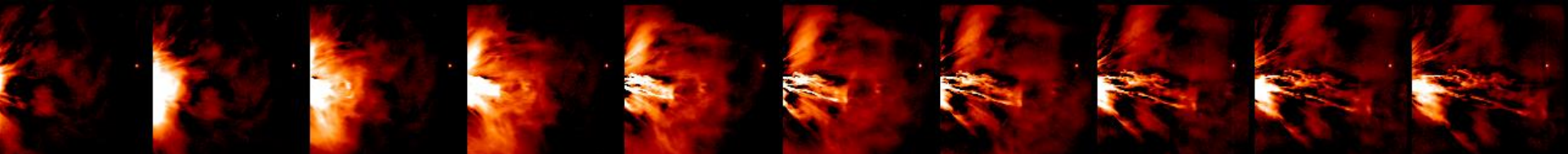
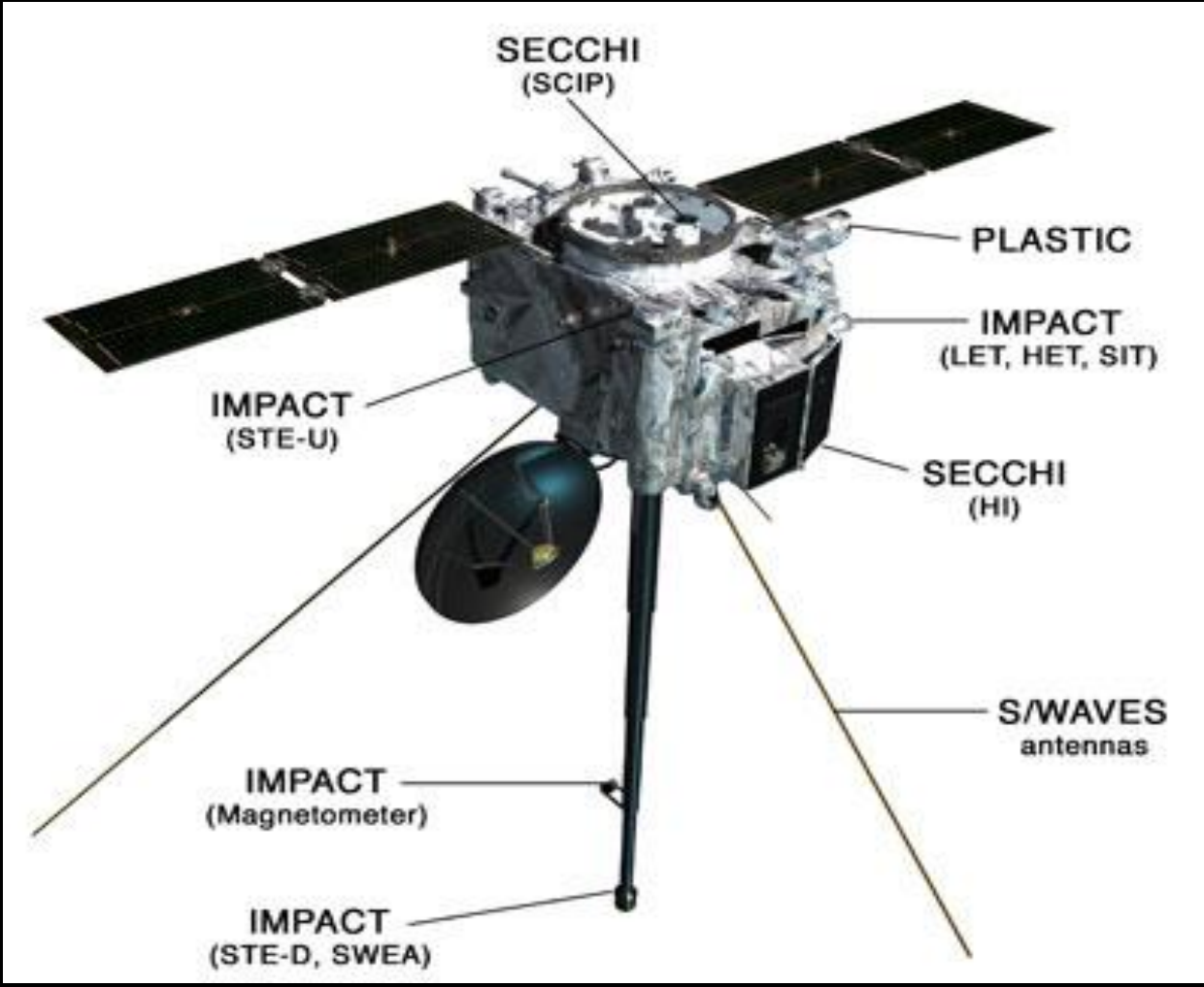
Event	kbps	Ahead	Behind
Instrument Off (Spacecraft Test)	0	6-Jul-2014	29-Sep-14
Nominal Science	120	15-Jul-2014	6-Oct-2014
HGA on 1 st Side Lobe	7.4	20-Aug-2014	1-Dec-2014
HGA on 2 nd Side Lobe	1.7	5-Jan-2015	6-Jan-2015
Instrument Off	0	22-Mar-2015	20-Jan-2015
HGA on 2 nd Side Lobe	1.7	14-Jul-2015	30-Mar-2015
HGA on 1 st Side Lobe	7.4	24-Sep-2015	25-Apr-2015
HGA on 2 nd Side Lobe (Behind Only)	1.7	NA	8-Jul-2015
HGA on 1 st Side Lobe (Behind Only)	7.4	NA	20-Nov-2015
Instrument Recommissioning	120	31-Dec-2015	5-Jan-2016

14-Nov-2014 : all dates subject to change (SPACECRAFT HEALTH IS PRIORITY ONE)





STEREO payload



Extreme Ultra Violet Imager (EUVI):

A full Sun instrument that images the chromosphere and corona out to $1.7 R_{\text{Sun}}$ (POS) in four emission lines:

He II 304\AA ,

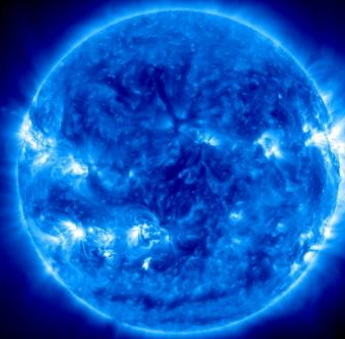
Fe IX/X 171\AA ,

Fe XII 195\AA and

Fe XV 284\AA .

SECCHI/EUVI

STEREO Ahead EUVI 171



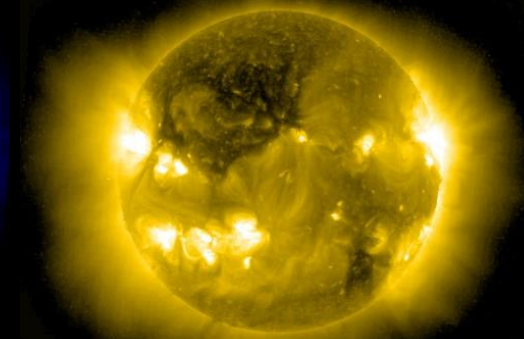
2013-06-01 22:14:00

STEREO Ahead EUVI 195



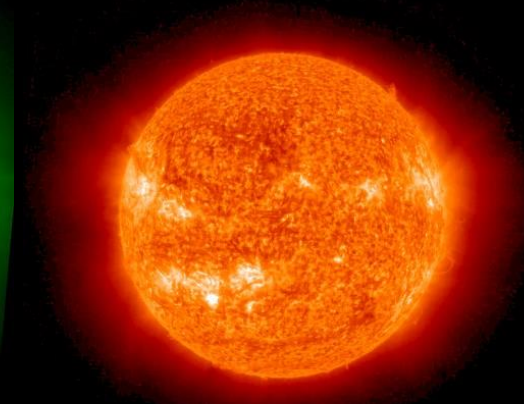
2013-06-01 22:15:30

STEREO Ahead EUVI 284

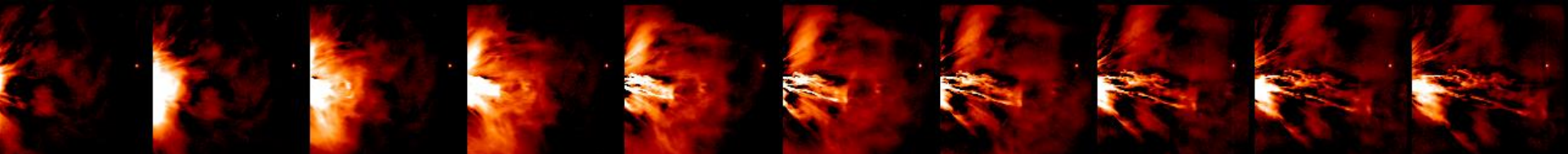


2013-06-01 22:16:30

STEREO Ahead EUVI 304



2013-06-01 22:16:15



STEREO Ahead COR1

SECCHI/COR1 & COR2

STEREO Ahead COR2

2011-06-07 07:40:18

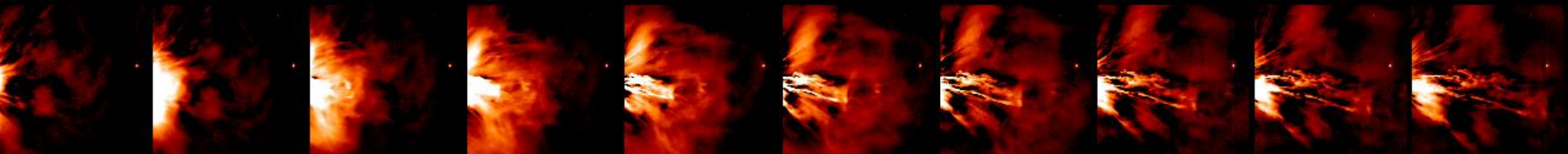
**Two white-light
CORonagraphs
(COR1 & COR2):**

Image the corona from:

COR1: $1.4 - 4 R_{\text{Sun}}$ (POS)

COR2: $2.5 - 15 R_{\text{Sun}}$ (POS)

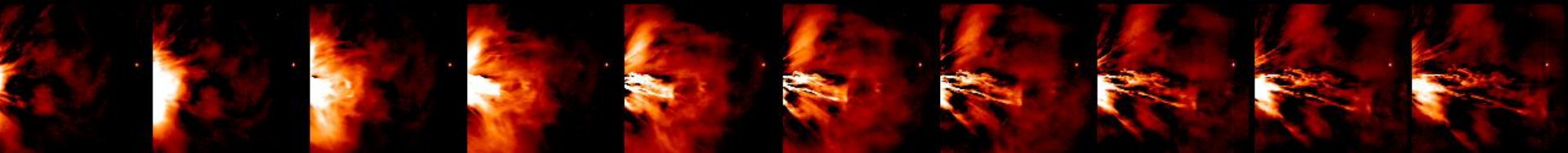
2011-06-07 08:24:00



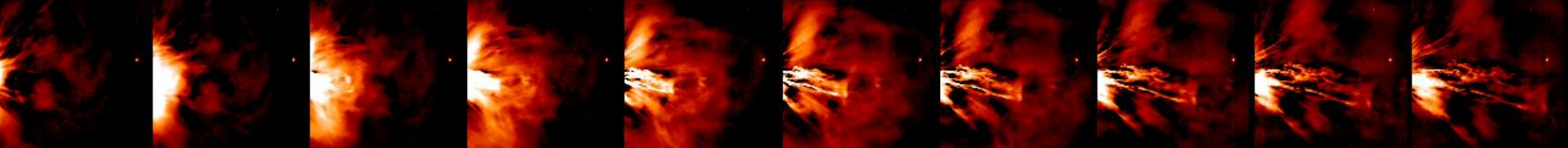
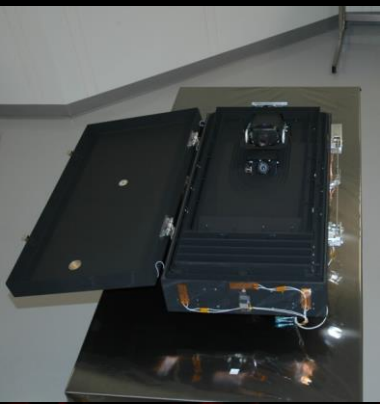
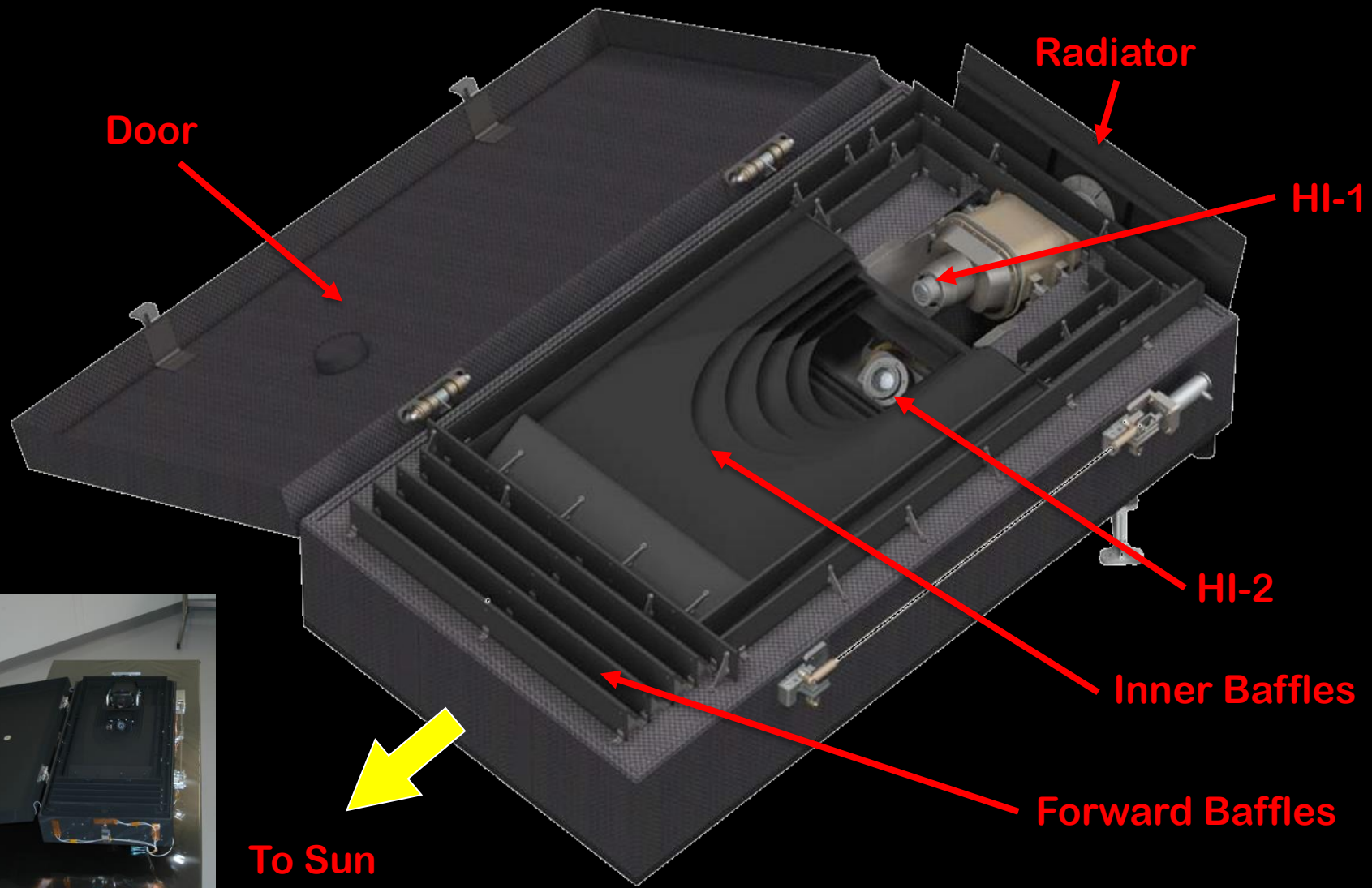
SECCHI/HI

Heliospheric Imager (HI): two CCD-based visible-light imagers, HI-1 & HI-2, that image the outer corona/inner heliosphere from 15 – 318 R_{Sun} (P-O-S).

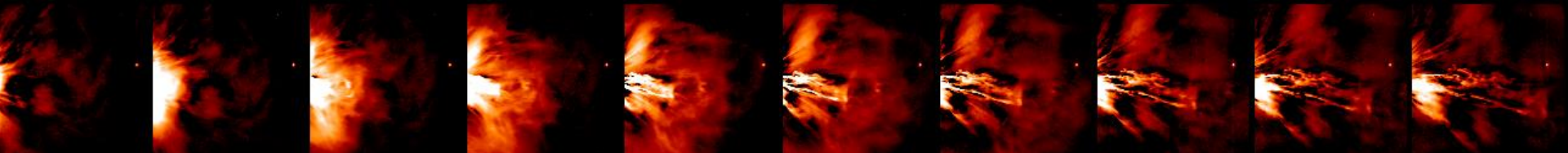
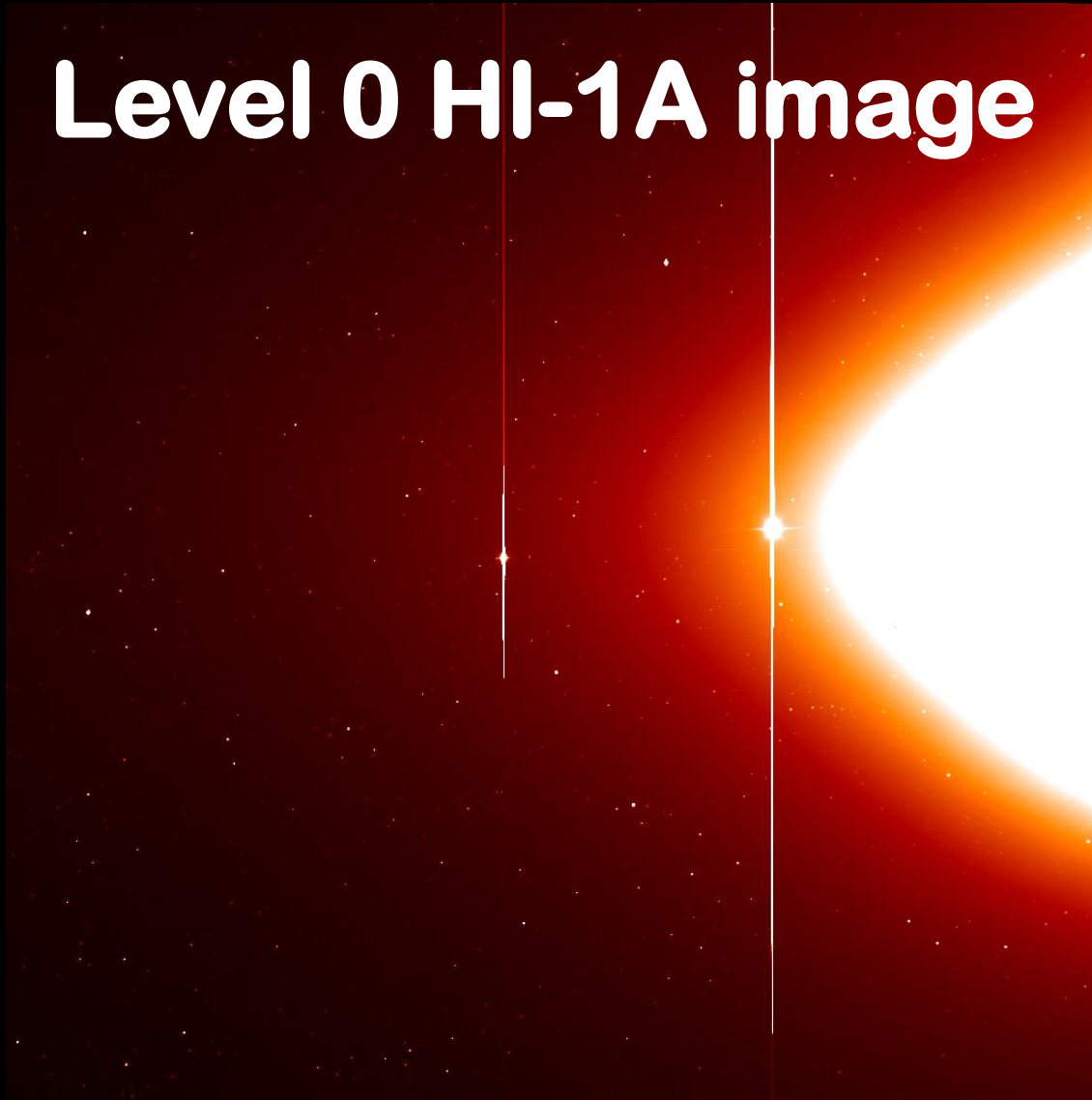
- HI-1:** 20 x 20° field-of-view centered on the ecliptic plane
Pixel size: 70 arcsec (1024x1024 nominal image)
Spectral pass-band: 630-730 nm
Nominal image cadence: 40 min
- HI-2:** 70 x 70° field-of view centered on the ecliptic plane
Pixel size: 4 arcmin (1024x1024 nominal image)
Spectral pass-band: 400-1000 nm
Nominal image cadence: 120 min



STEREO-A: HI door opened 13 Dec 2006
STEREO-B: HI door opened on 11 Jan 2007

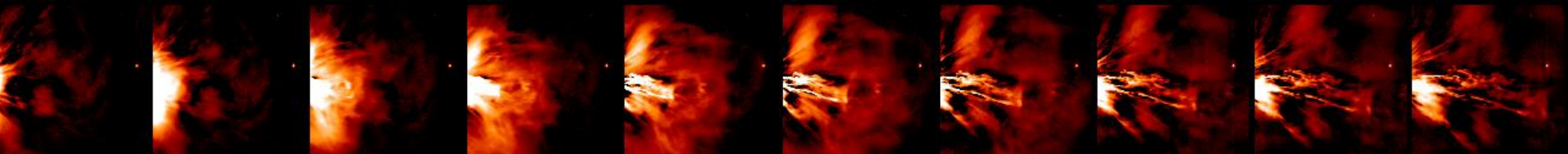


Level 0 HI-1A image



Level 2 HI-1A image

(1-day running background subtracted)



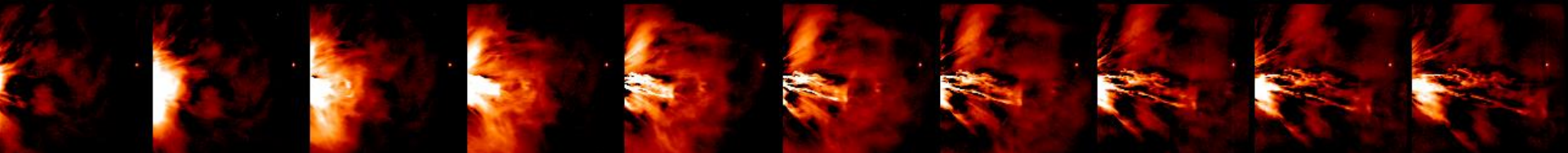
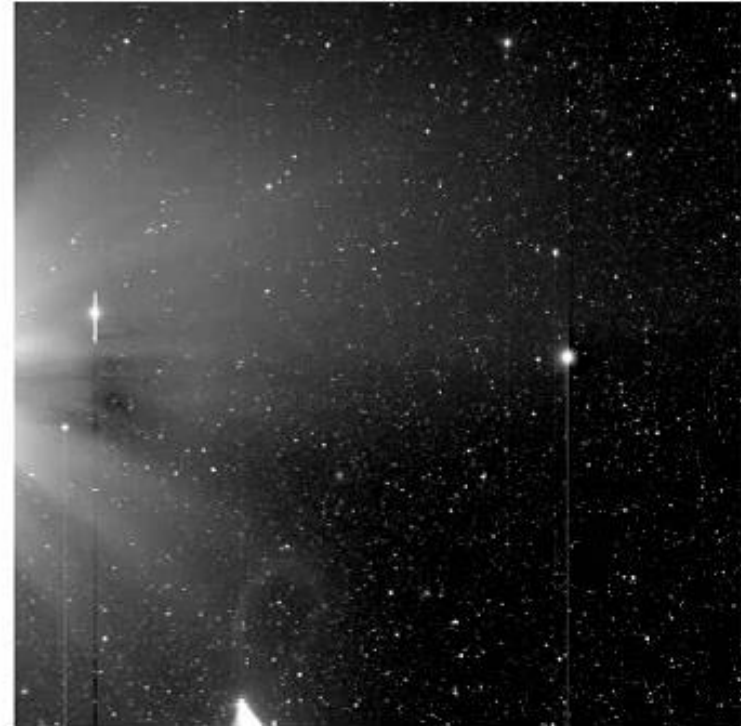
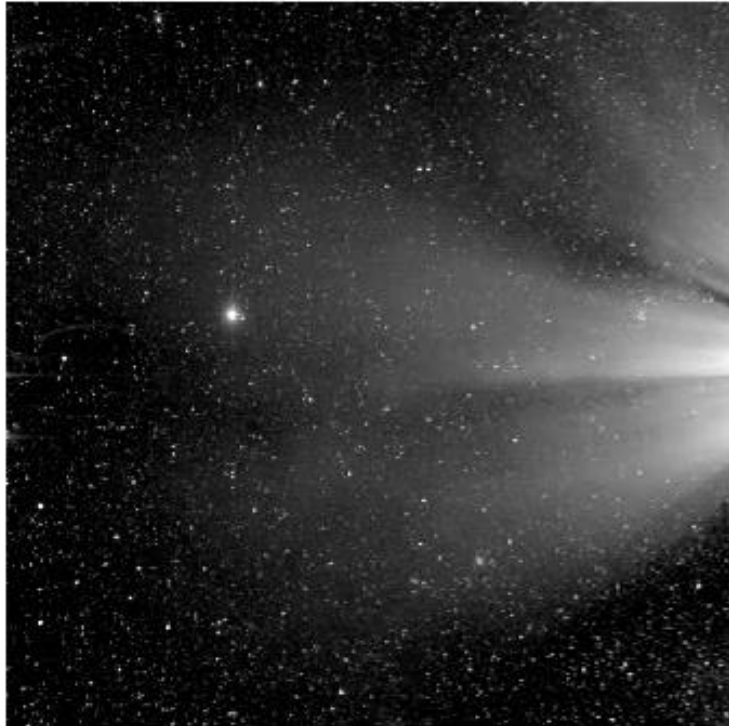
STEREO/SECCHI



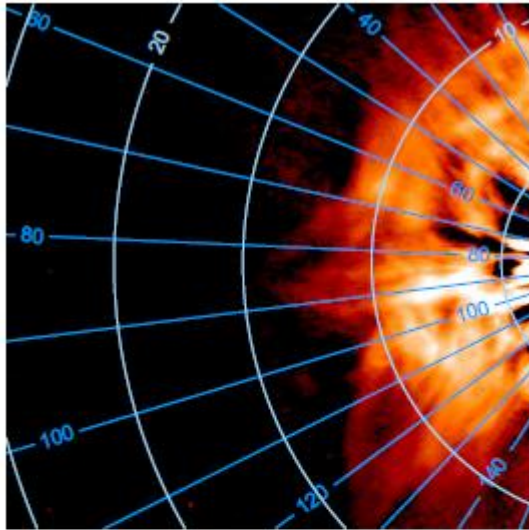
2013-03-10 00:09UT

HI-1A

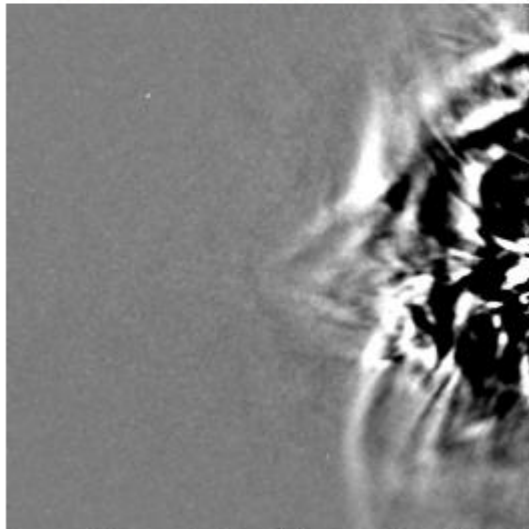
HI-1B



STEREO/HI-1A
2011-09-24 20:49UT



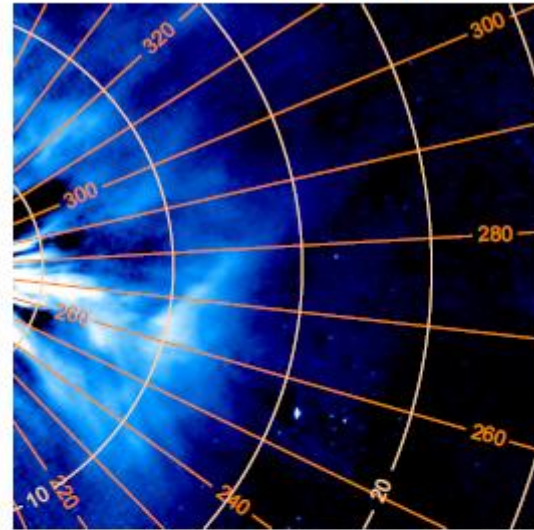
Background subtracted (1-day background)



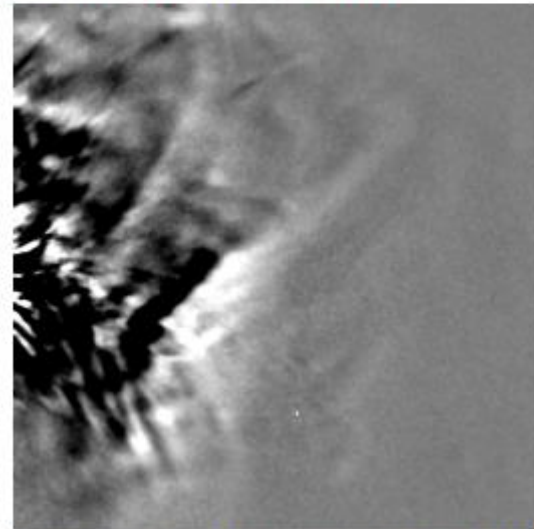
Running difference (subtracted image: 2011-09-24 20:09UT)



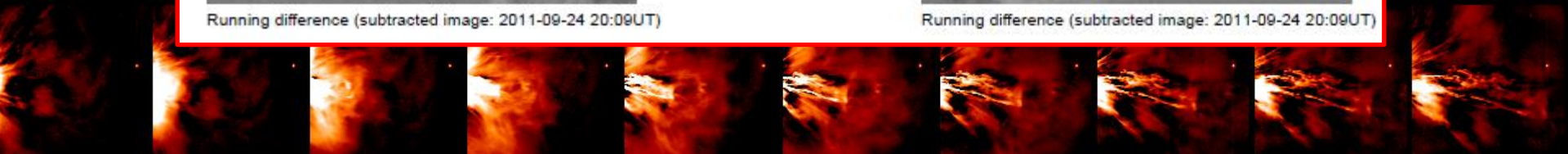
STEREO/HI-1B
2011-09-24 20:49UT



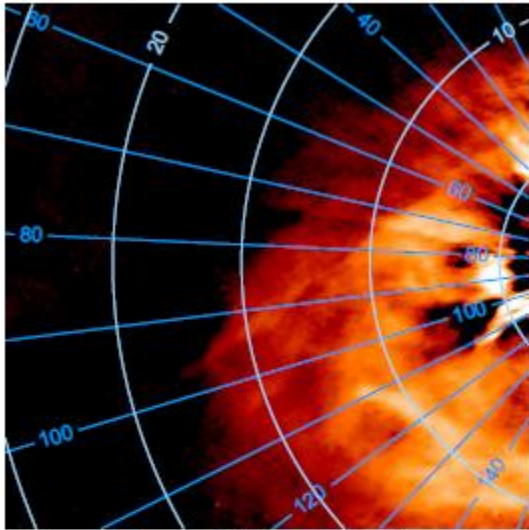
Background subtracted (1-day background)



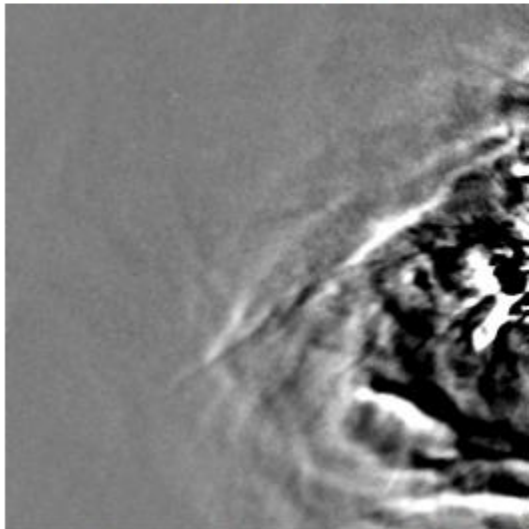
Running difference (subtracted image: 2011-09-24 20:09UT)



STEREO/HI-1A
2011-09-25 22:09UT



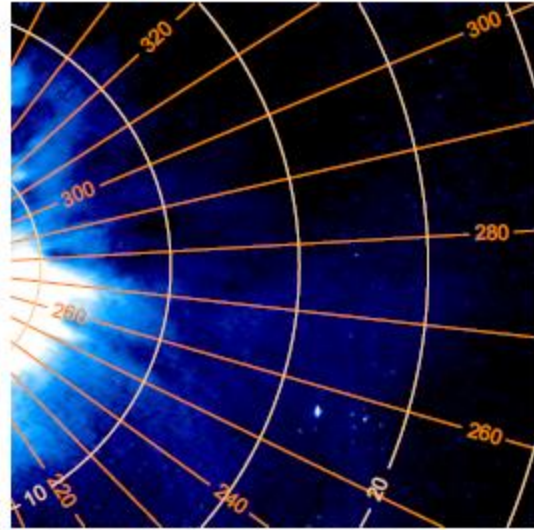
Background subtracted (1-day background)



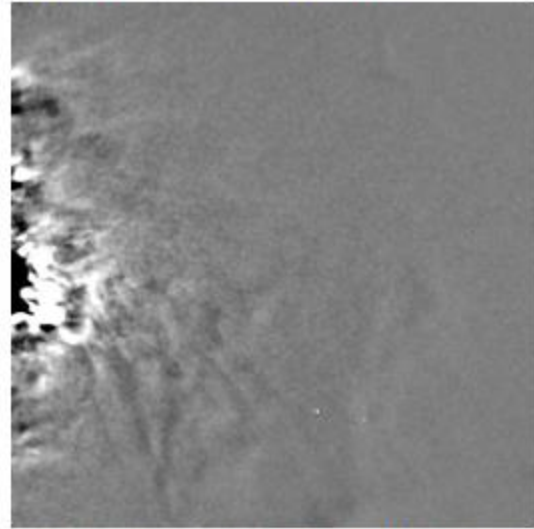
Running difference (subtracted image: 2011-09-25 21:29UT)



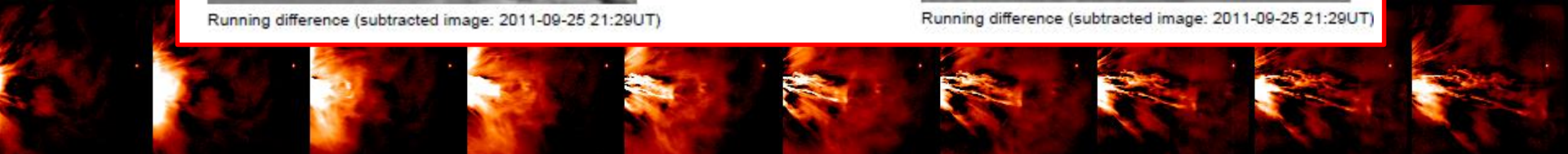
STEREO/HI-1B
2011-09-25 22:09UT



Background subtracted (1-day background)

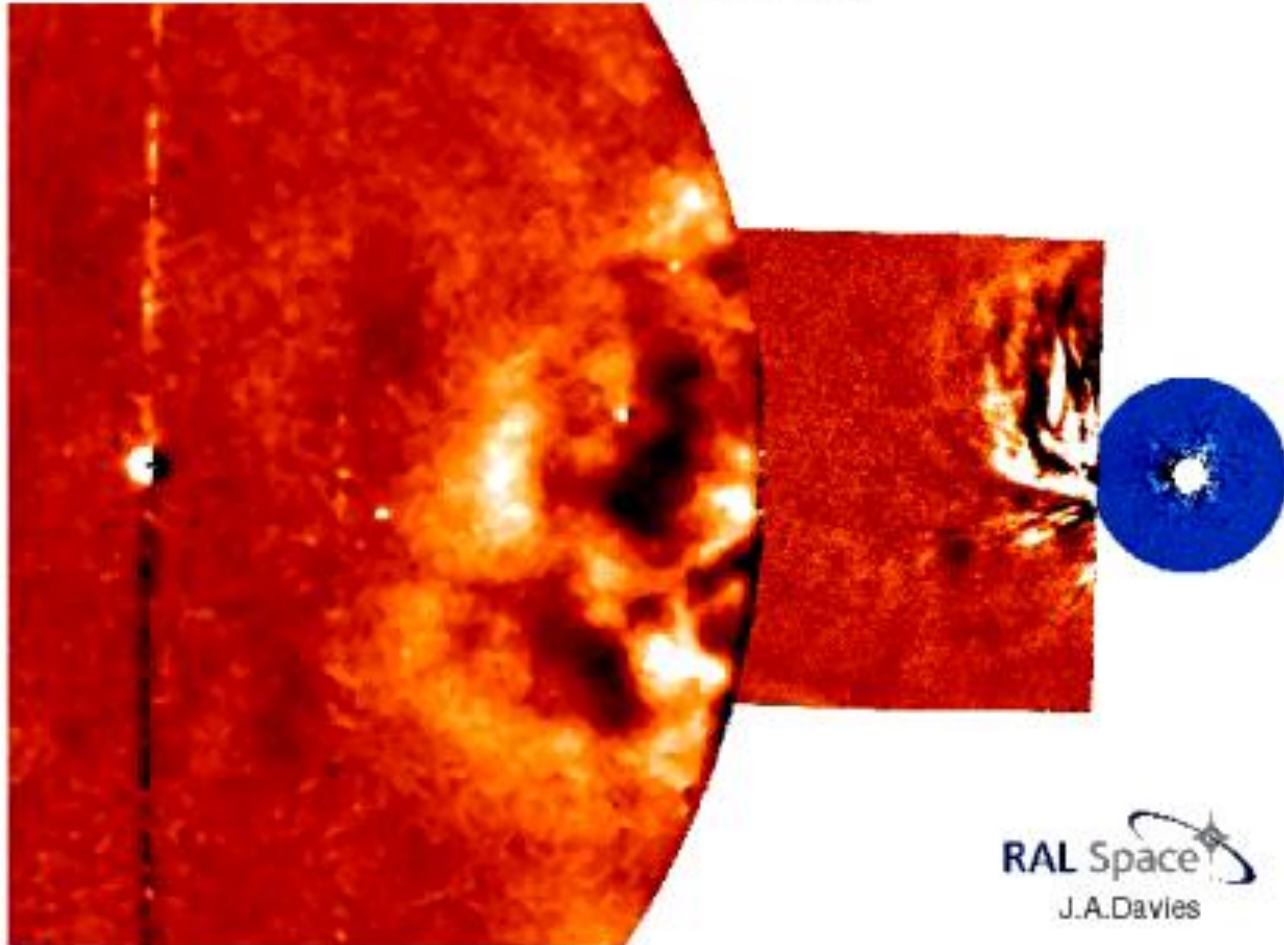


Running difference (subtracted image: 2011-09-25 21:29UT)

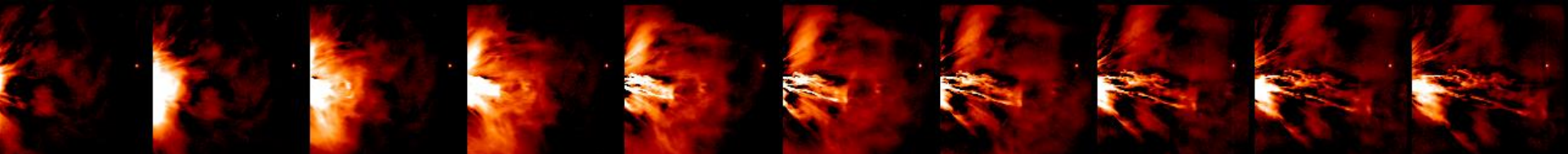


STEREO-A/SECCHI

2011-06-06 00:00UT



RAL Space
J.A.Davies





WP2: Producing a definitive catalogue of CMEs imaged by STEREO/HI

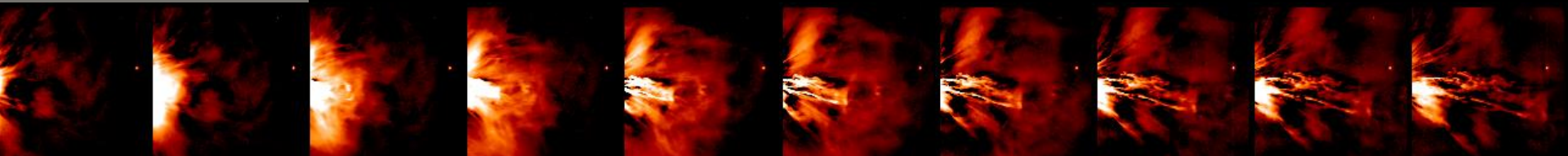
Type of Activity: RTD

Lead: Jackie Davies (STFC; 1)

Participants: STFC (1); UGOE (4); ROB (5)

Duration: Month 1 – 36

This WP provides the foundation for this project, namely the production of a catalogue of CMEs in the heliosphere produced from manual inspection of STEREO/HI data; use of automated techniques are also being investigated. Comparisons with coronal CME catalogues is also be made.





WP2 Task 1: STFC

Manual cataloguing of STEREO/HI CMEs

WP2 Task 2: ROB

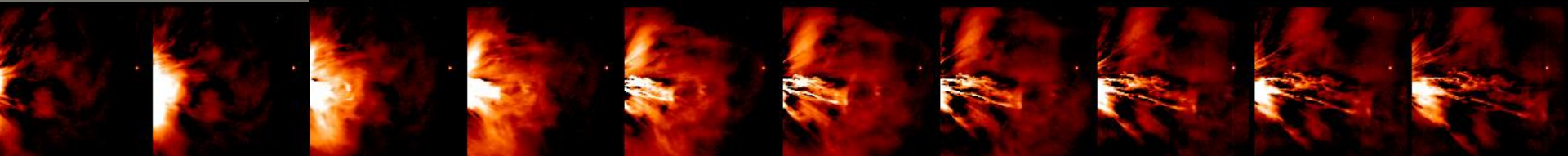
Automatic cataloguing of STEREO/HI CMEs

WP2 Task 3: UGOE, STFC, ROB

Comparison of CME catalogues

WP2 Task 4: STFC

Scientific management





WP2: Deliverables

List of deliverables

Deliverable Number ⁶¹	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature ⁶²	Dissemination level ⁶³	Delivery date ⁶⁴
D2.1	Catalogue of observational parameters of HI-1 manually-identified CMEs	1	13.50	Other	PU	36
D2.2	Report on the feasibility of automatic identification of CMEs in HI-1 data	5	14.00	Report	PP	12
D2.3	Report on the inter-comparison of the manual and automated CME catalogues	1	12.00	Report	PP	18
D2.4	Report in which the manual and automated HI CME catalogues are compared to pre-existing coronagraph CME catalogues	1	8.00	Report	PP	24
D2.5	Scientific management of HELCATS	1	4.00	Other	PP	36
Total			51.50			

Description of deliverables

