

# Deflection characteristics of a streamer produced by a CME-driven shock

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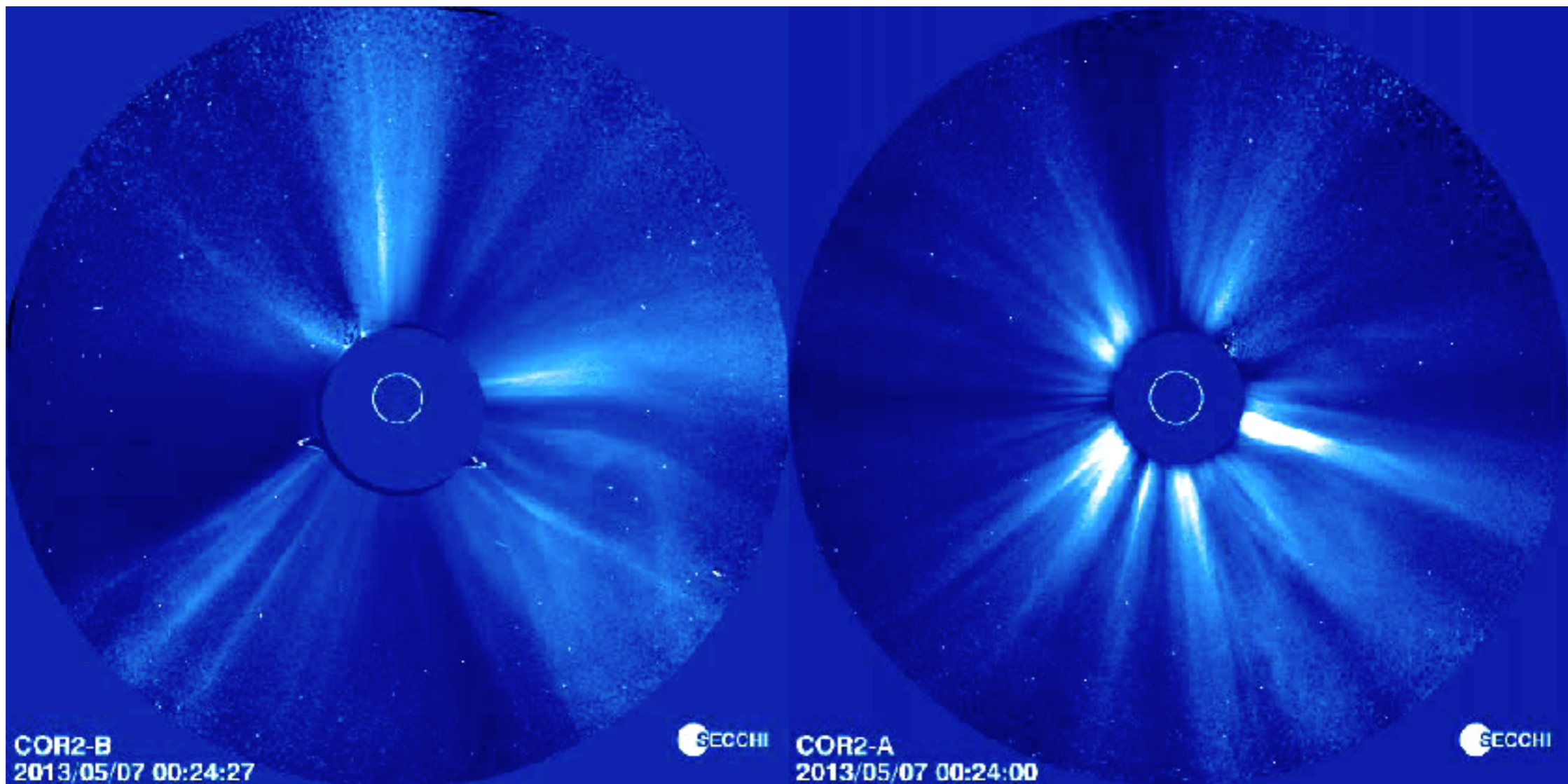
Yunnan Observatories, CAS, China

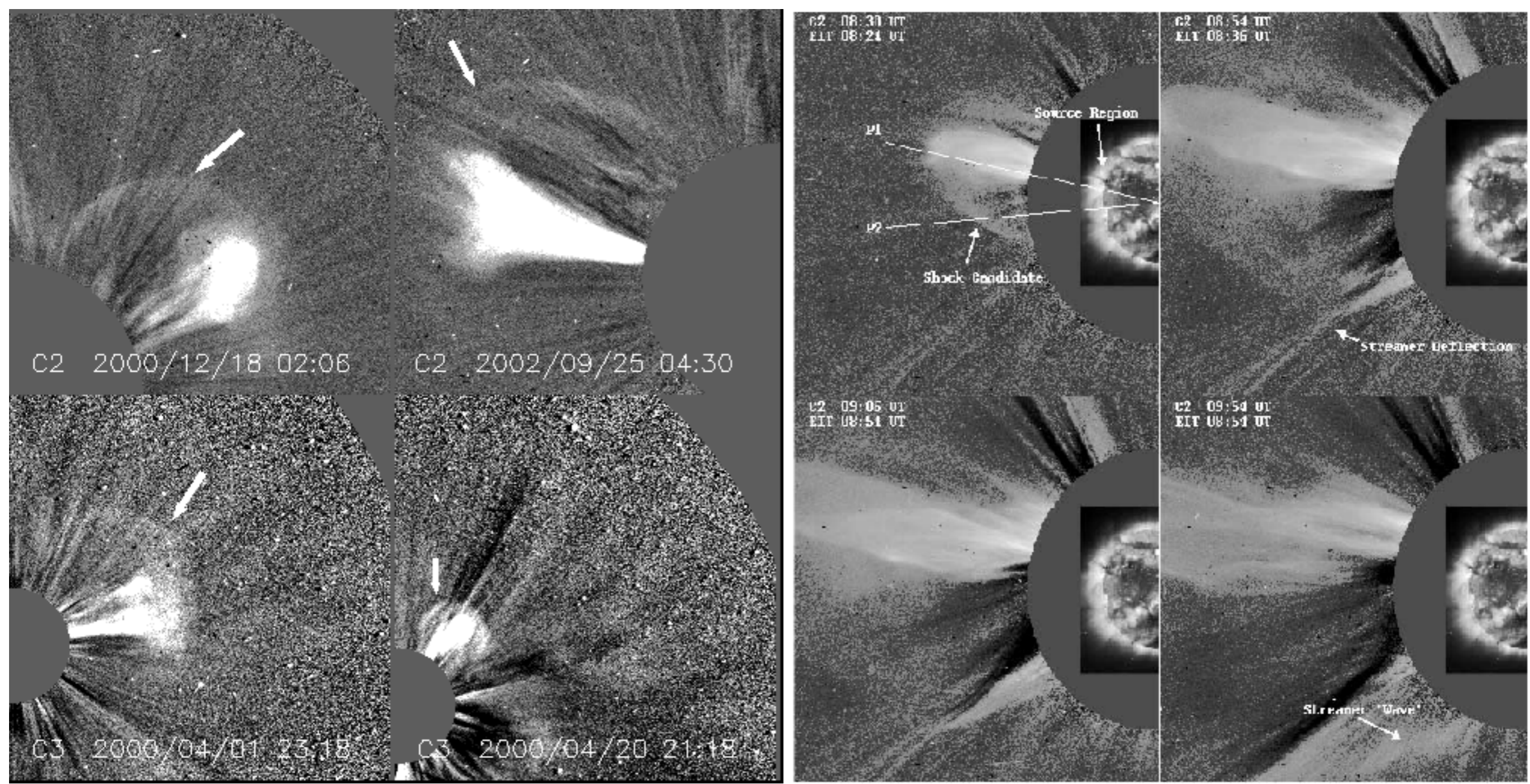
2017.01. 17 Beijing



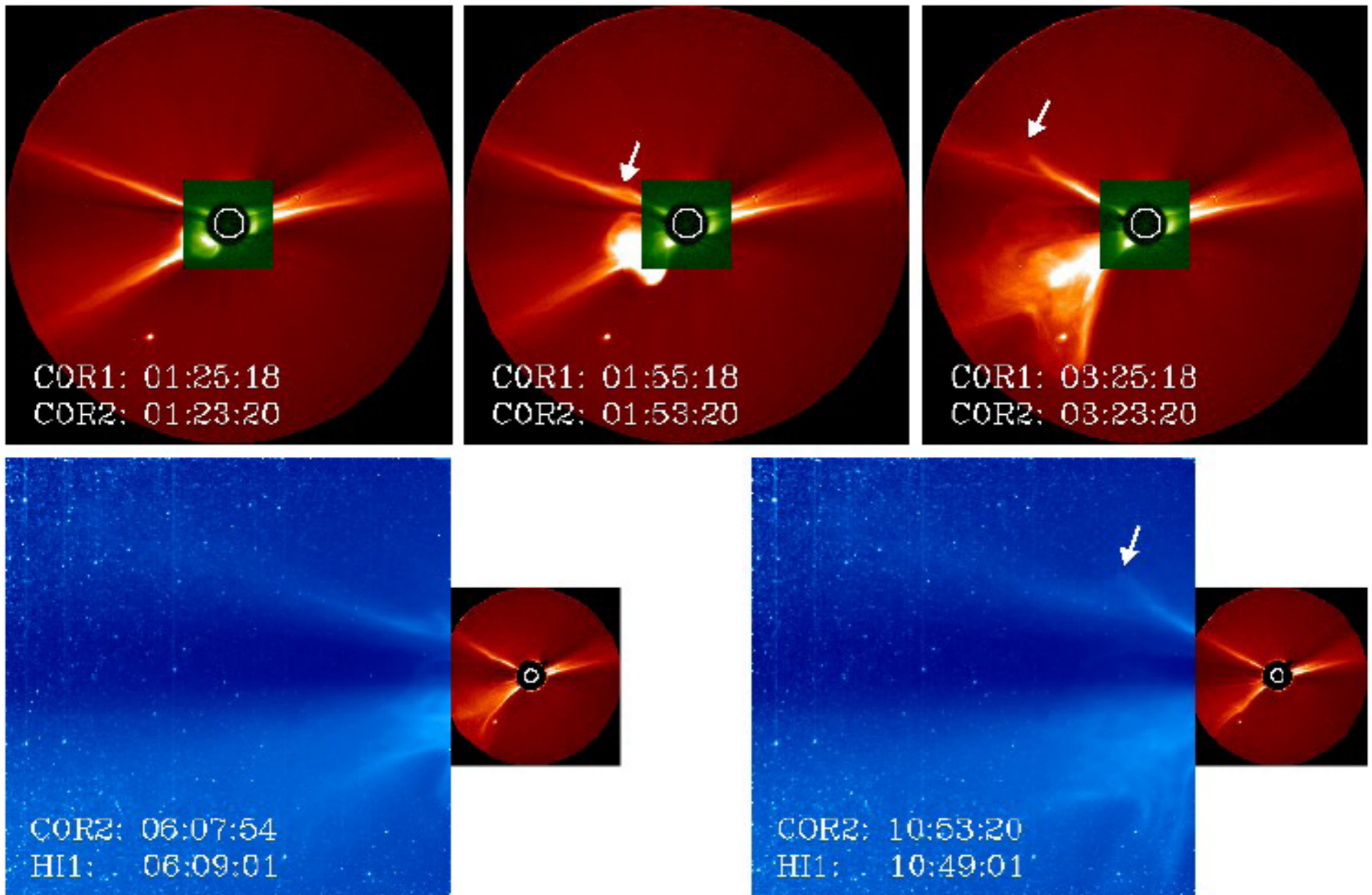
# Introduction

- Streamers in the outer corona are often pushed aside by disturbance produced by CMEs, and this is thought to be caused by the shock driven by CMEs (Sime & Hundhausen 1987, Sheeley et al. 2000).
- Since CME-driven shock waves are faintly visible ahead of CMEs in the white-light coronagraph observations, the response of remote streamers could be used for detecting shock waves in the outer corona (Gosling et al. 1974 ; Vourlidas et al. 2003 ).
- Here, I present the deflection characteristics of a streamer produced by a CME-driven shock





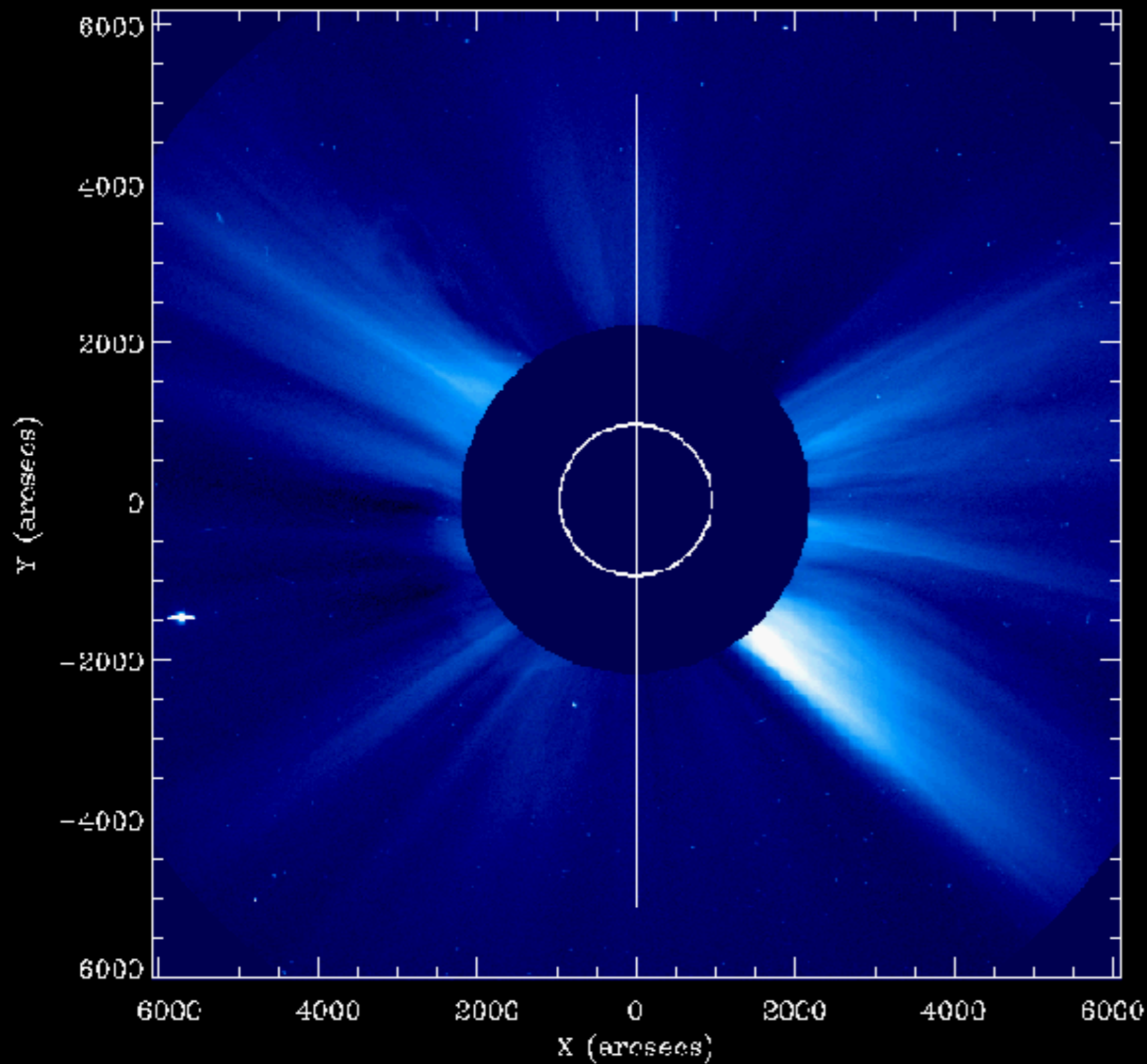
a clear example of shock front in the outer corona, and the deflection of a remote streamer (Vourlidas et al. 2003)



The streamer deflection indicates the existence of the CME-driven shock, and it is in good timing with the metric type II burst (Liu et al. 2009)

C:\archive\soho\lasco\040703-07\c2\22174245.fts

SOHO LASCO C2 6-Jul-2004 20:06:06.633 UT



An Impulsive case can launch “streamer waves” along the streamer stalk (Chen et al. 2010, Feng et al. 2011)

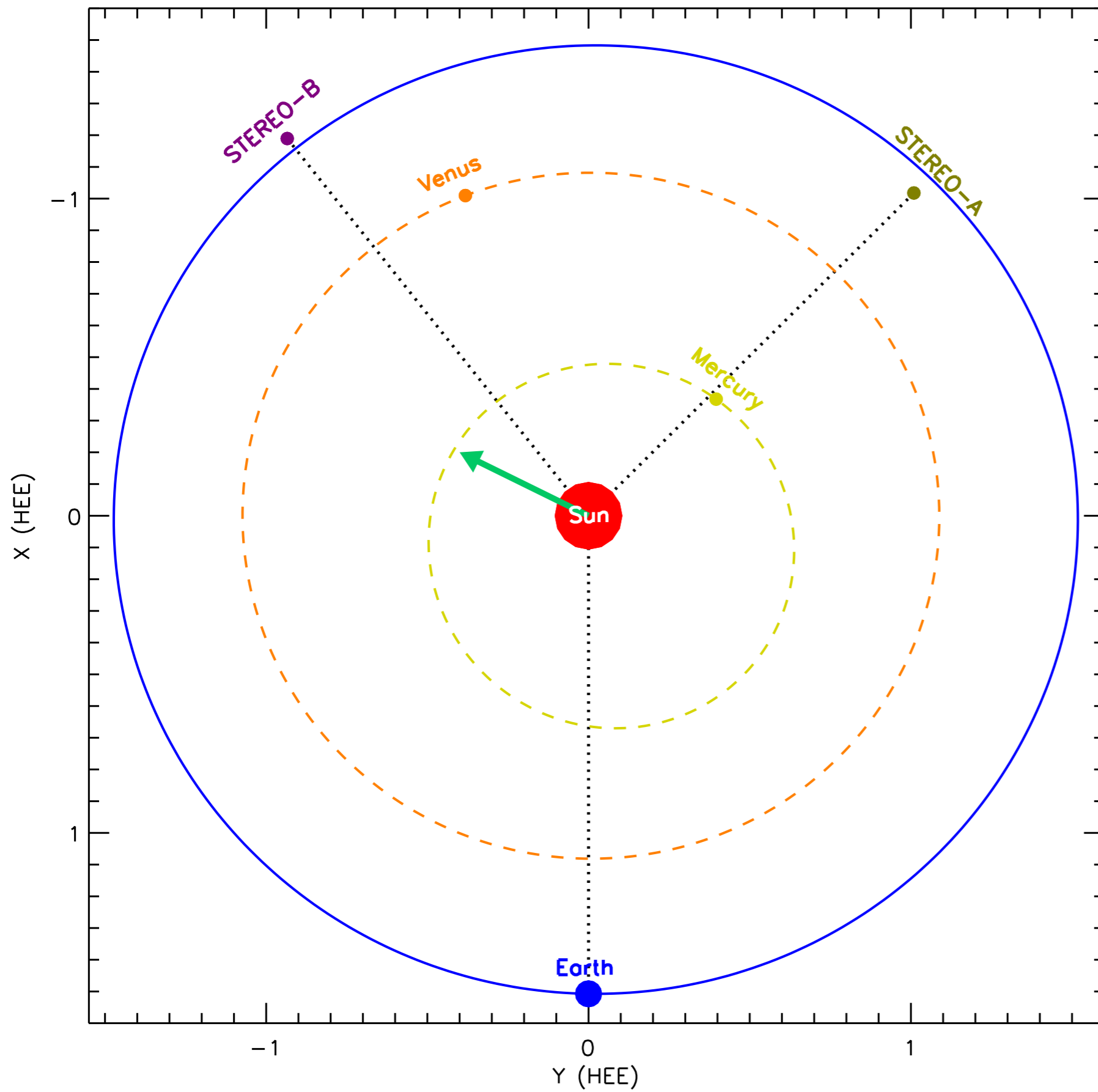
Period:  
~ 1 hour

wavelength:  
2-4 solar radii

amplitude:  
~ 0.2 solar radii

Phase speed:  
300 - 500 km/s

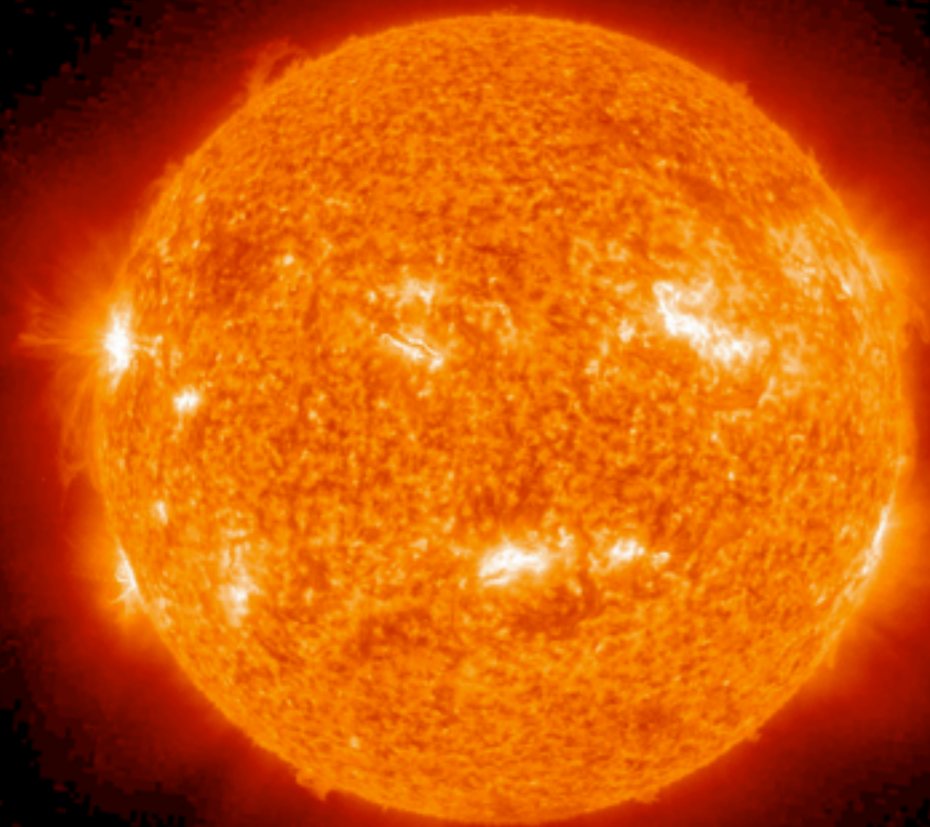
CME speed: 1400 km/s



Separation angles:  
STEREO-A and STEREO-B:  $83^\circ$   
STEREO-A and Earth:  $141^\circ$   
STEREO-B and Earth:  $135^\circ$

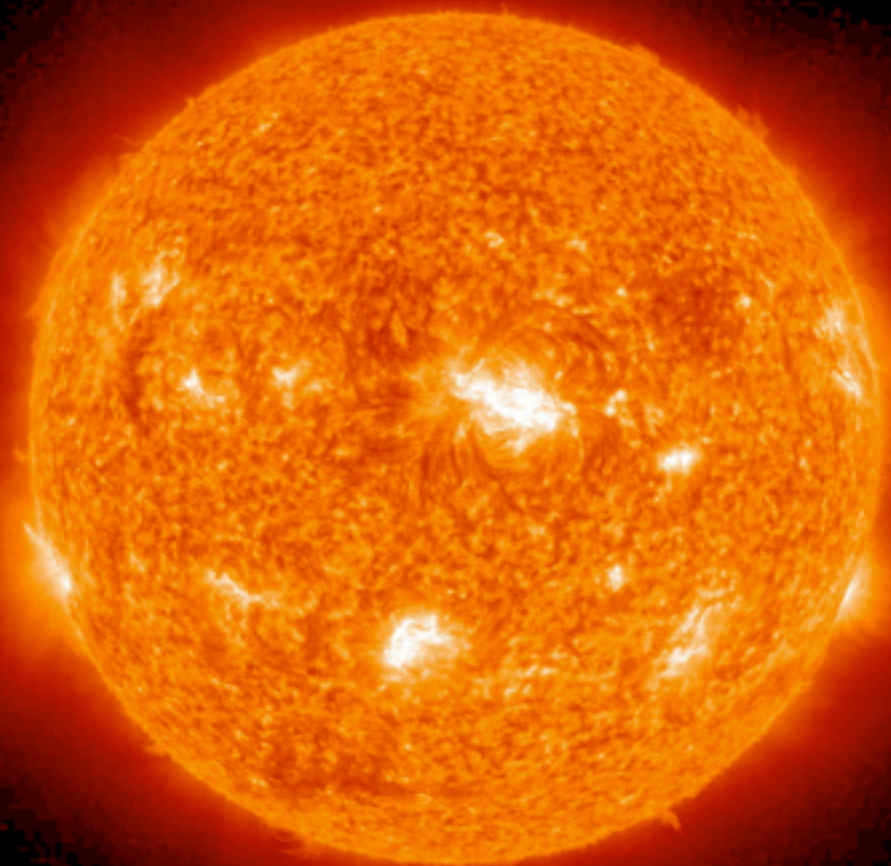
May,01, 2013 03:00 UT

STEREO Behind EUVI 304



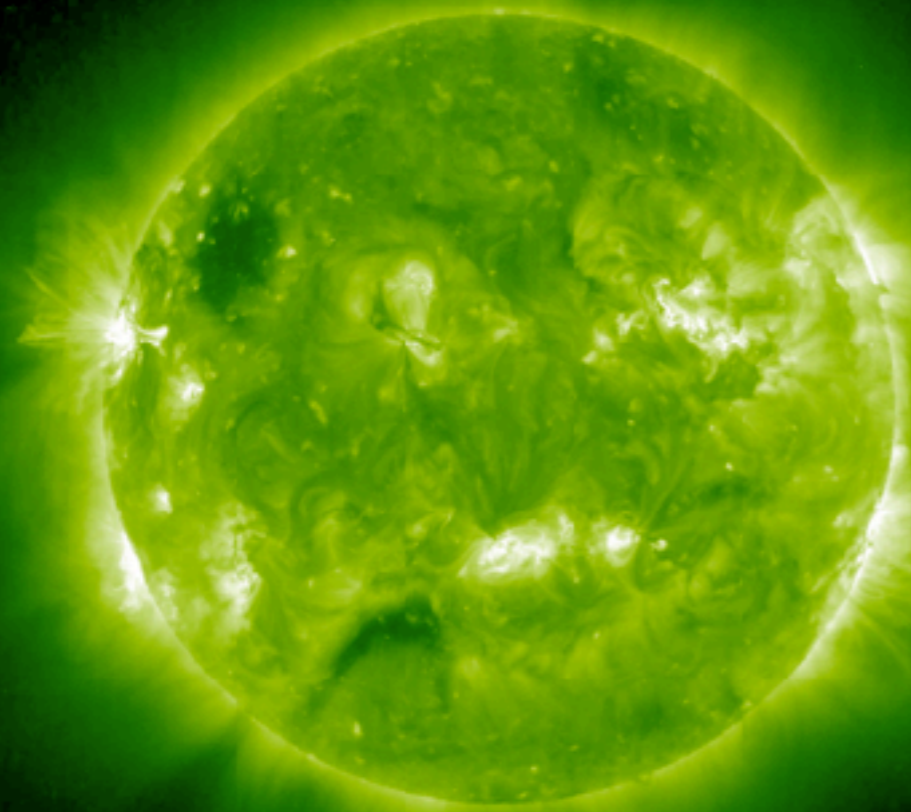
2013-05-01 00:06:42

STEREO Ahead EUVI 304



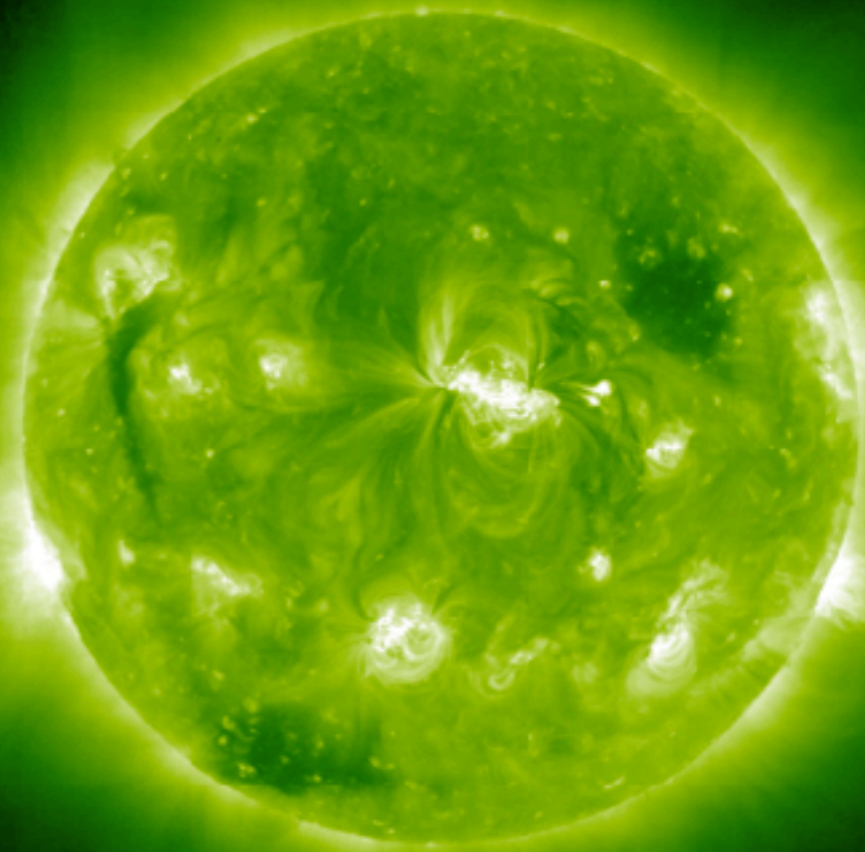
2013-05-01 00:06:15

STEREO Behind EUVI 195



2013-05-01 00:05:58

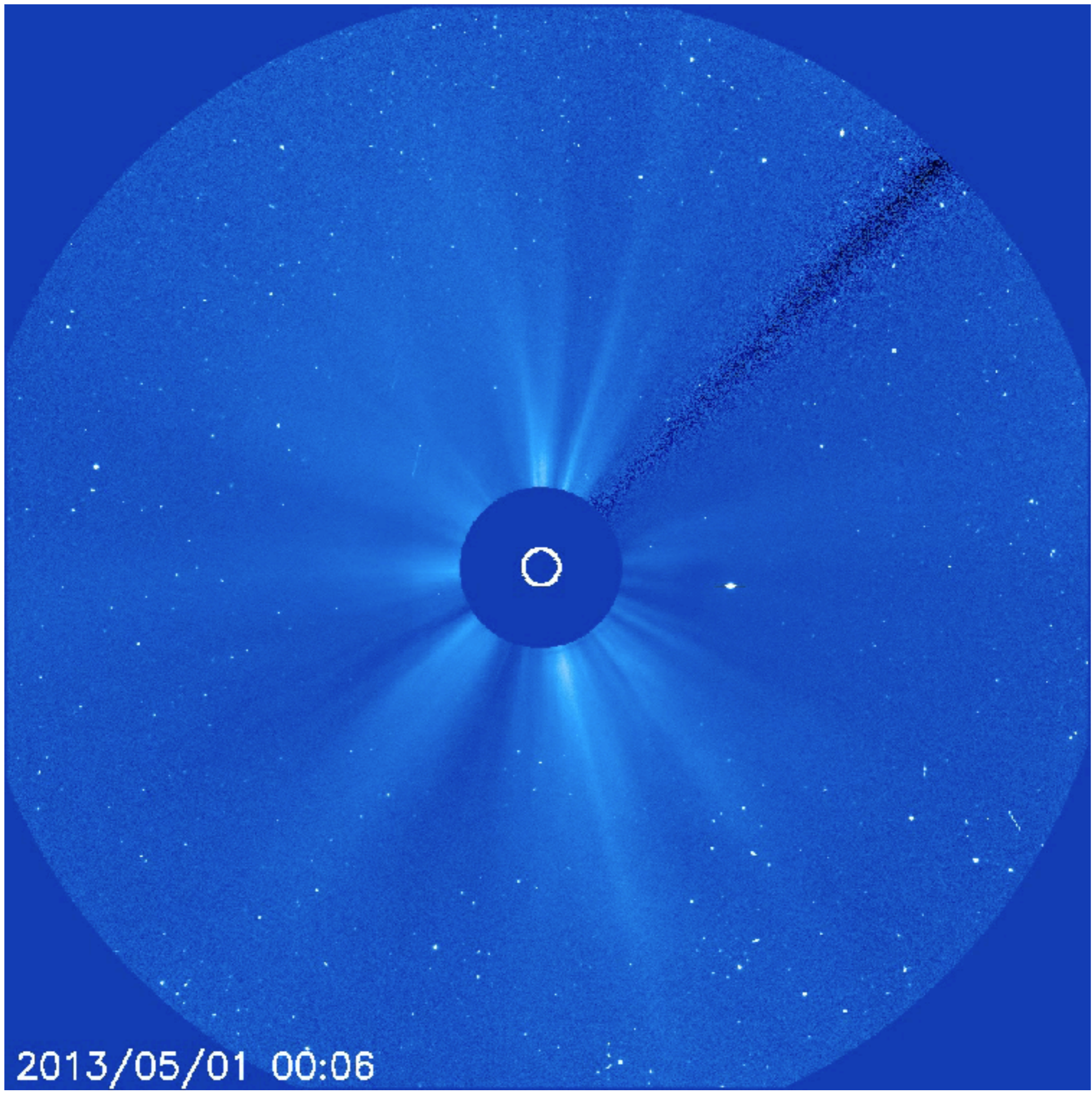
STEREO Ahead EUVI 195



2013-05-01 00:05:30



2013/05/01 00:06

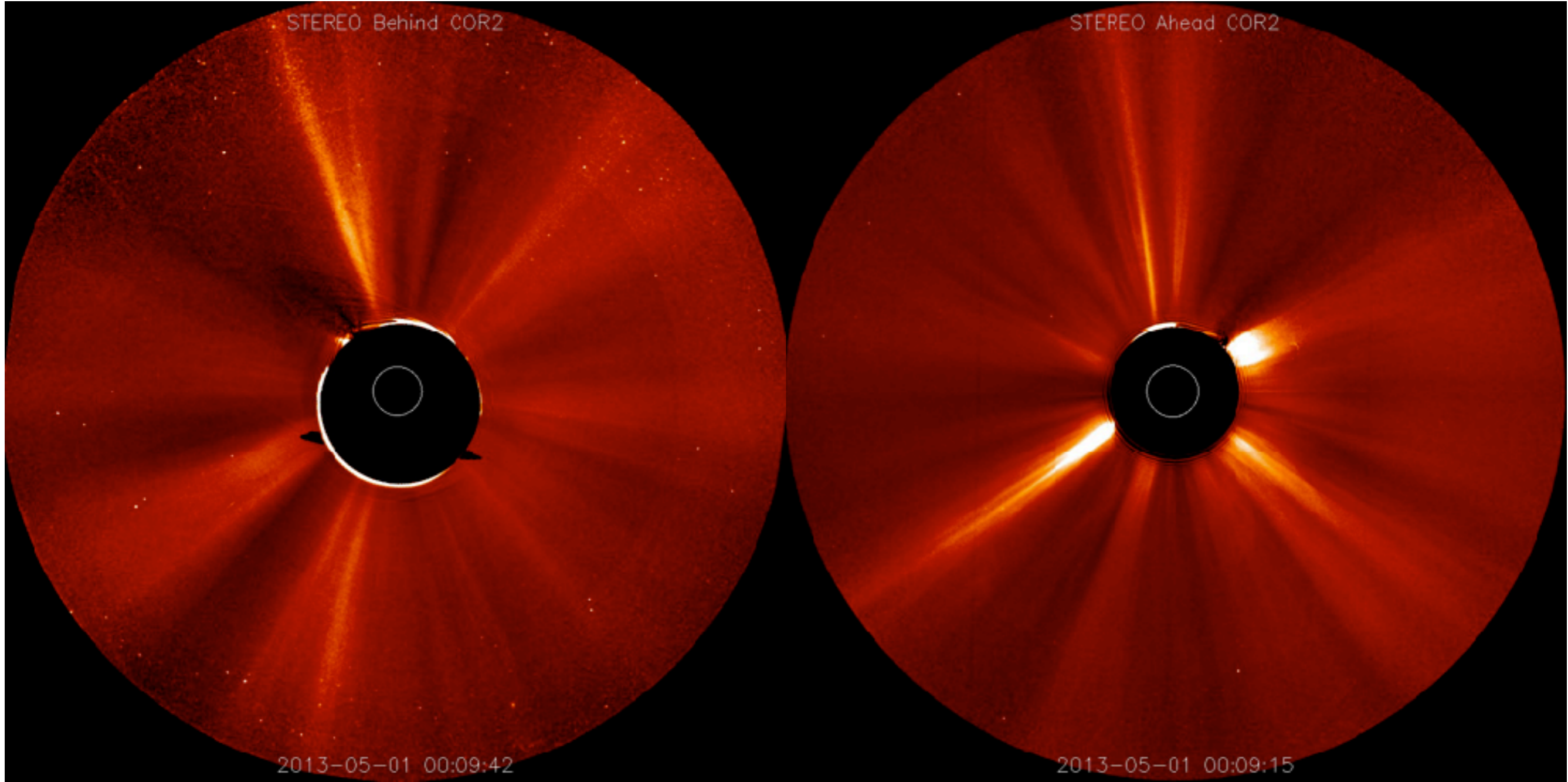


STEREO Behind COR2

STEREO Ahead COR2

2013-05-01 00:09:42

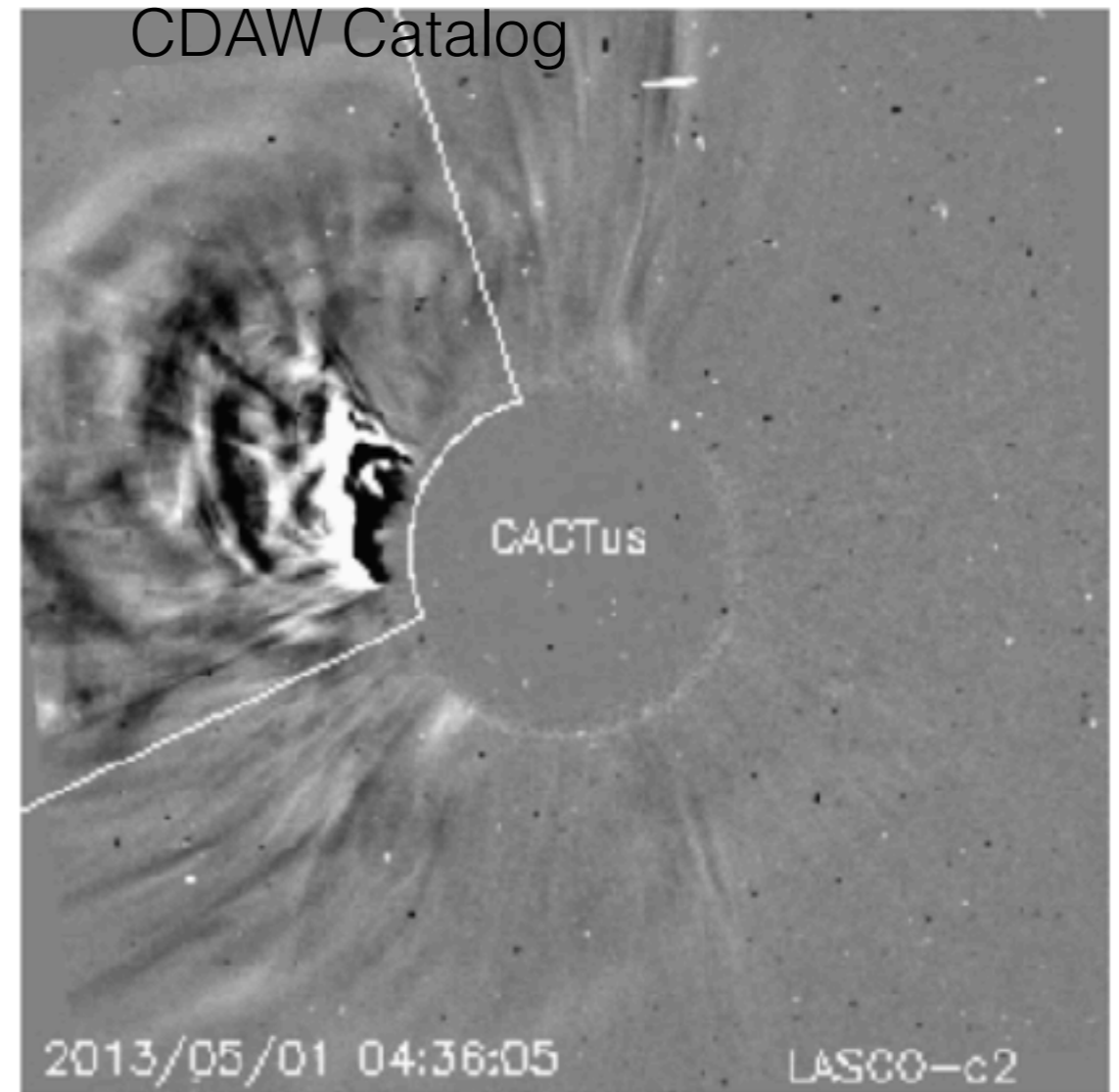
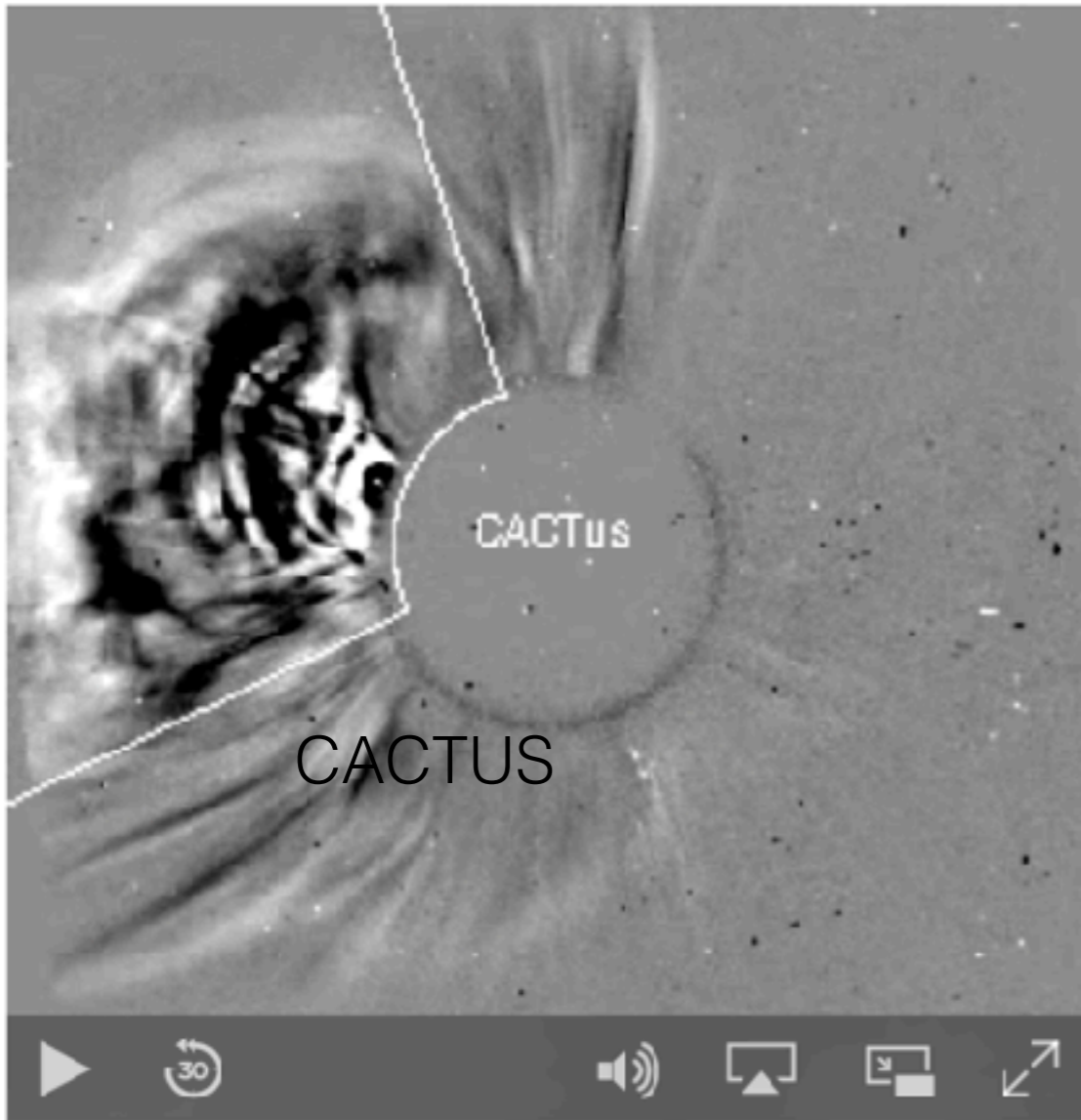
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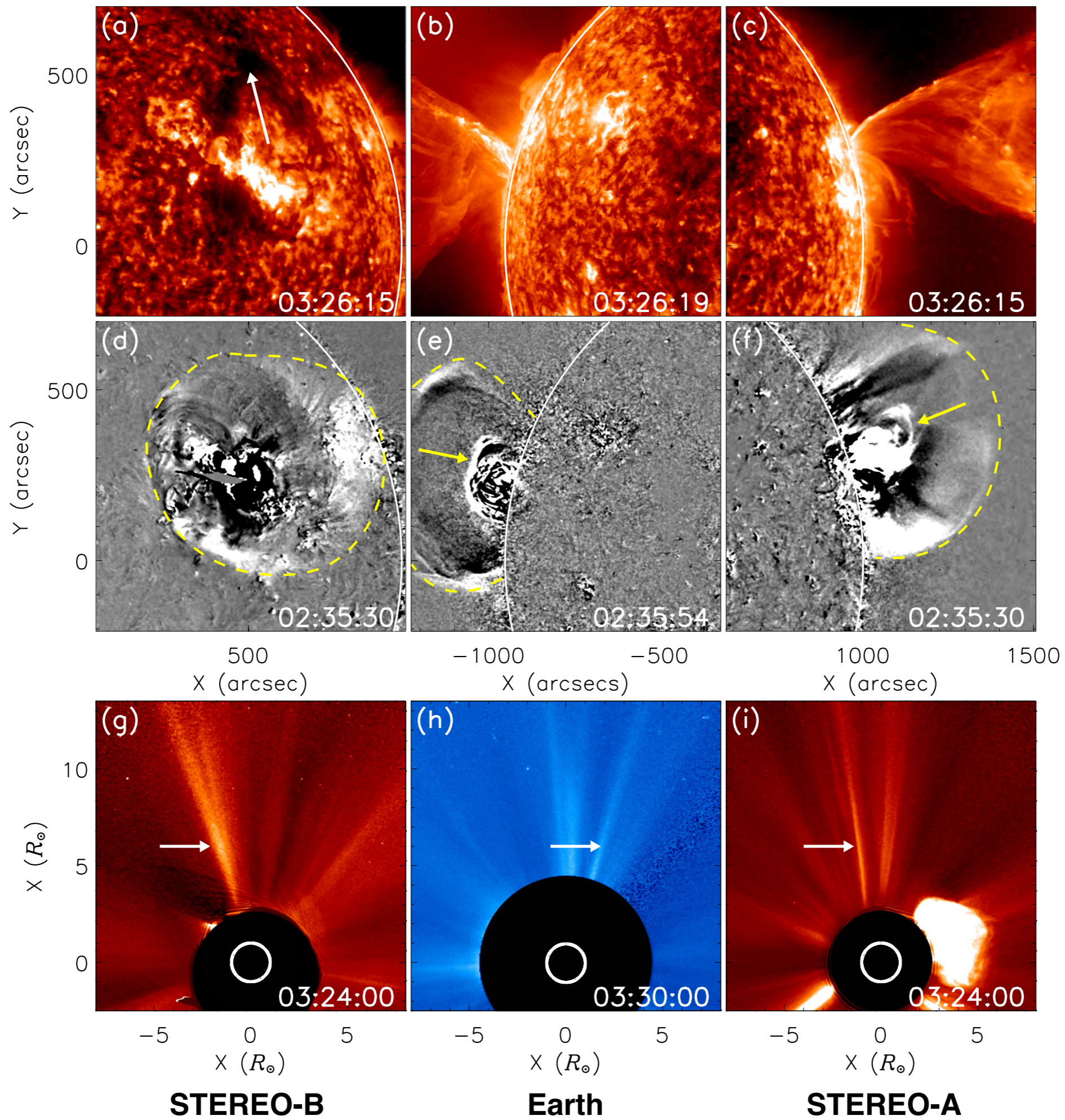


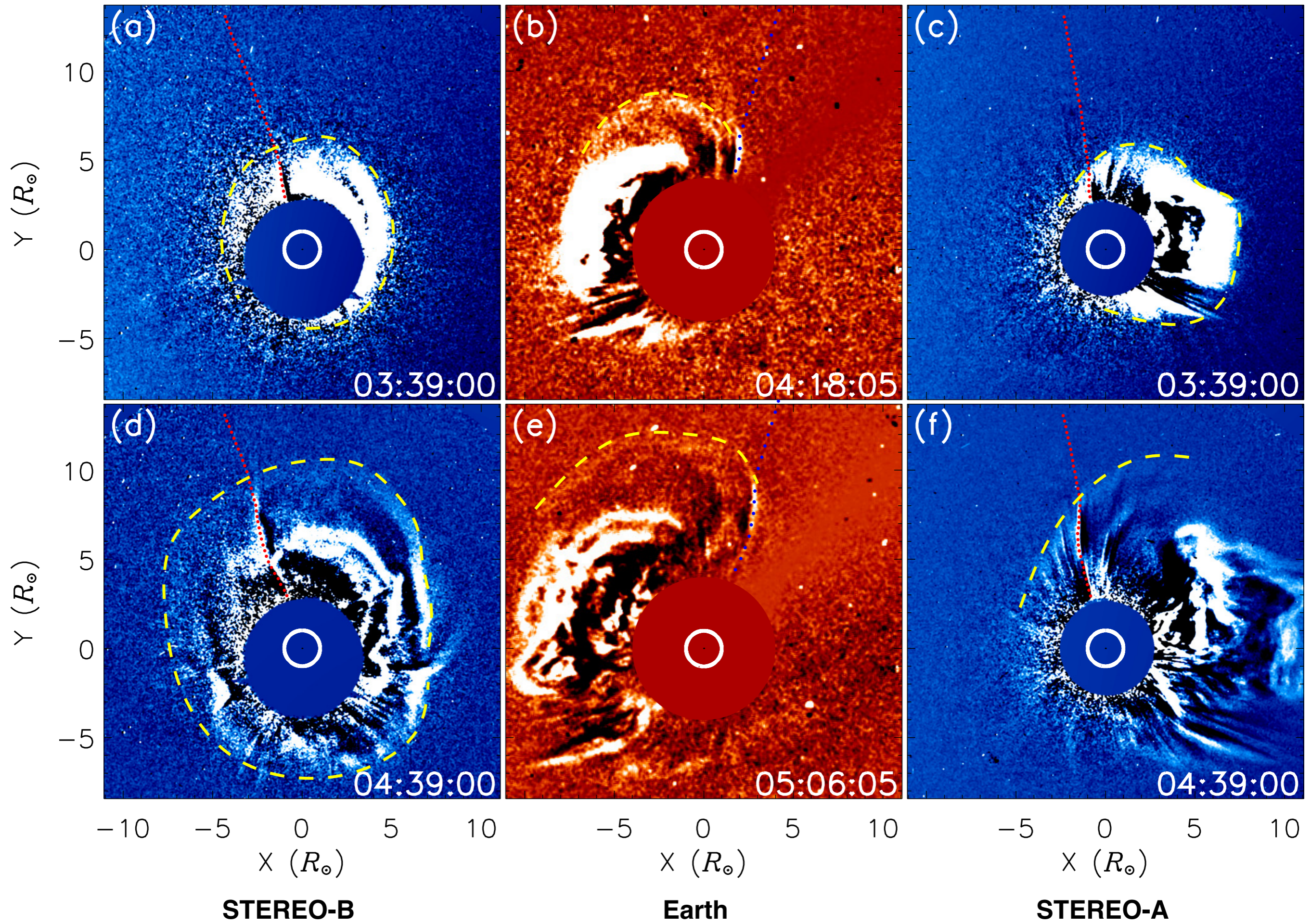
#	CME	t0	dt0	pa	da	v	dv	minv	maxv	halo?
0001		2013/05/01 03:12	04	066	098	0499	0093	0425	0702	II

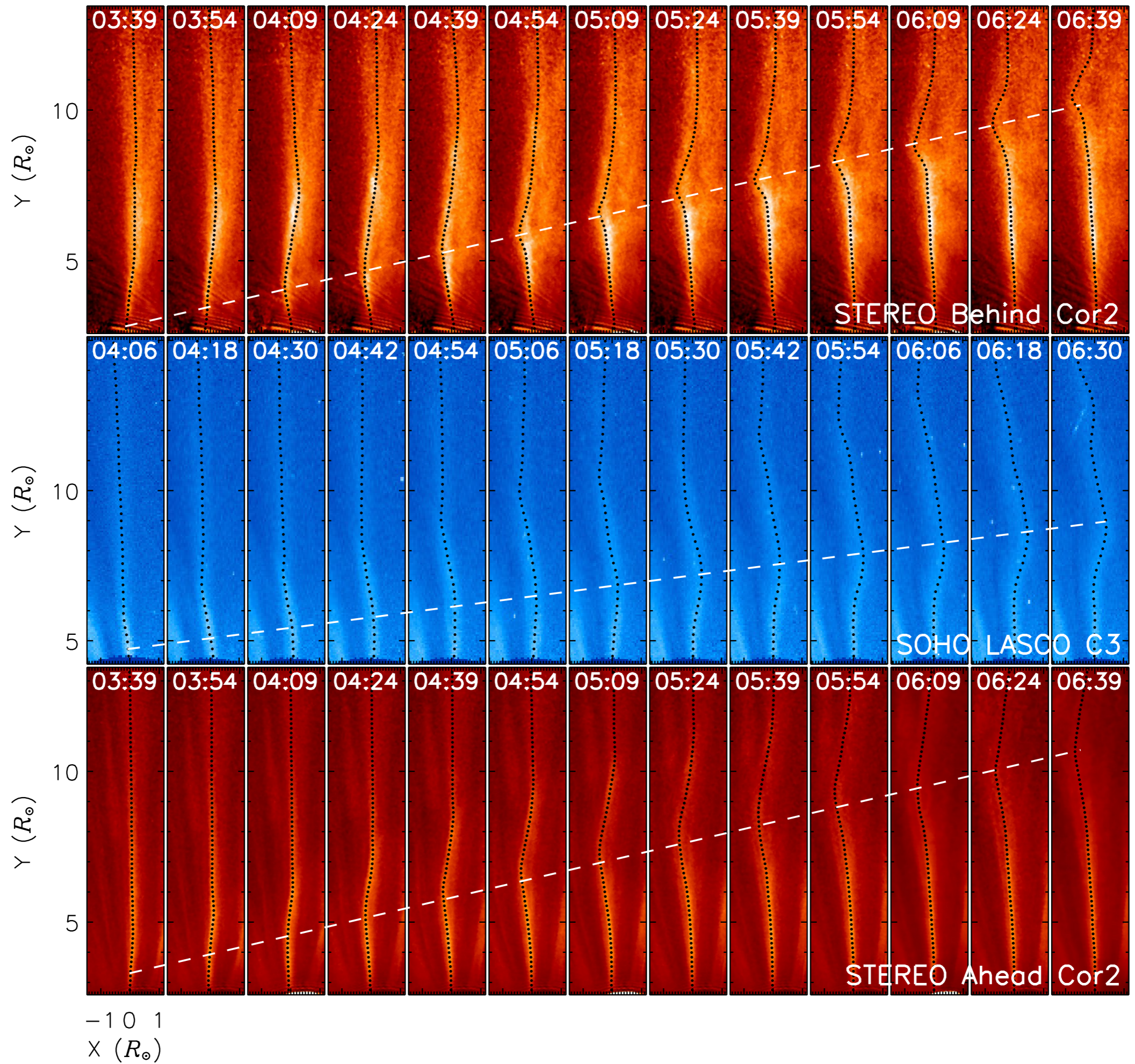
CME Movie :: [Download](#) ::

Sample Image

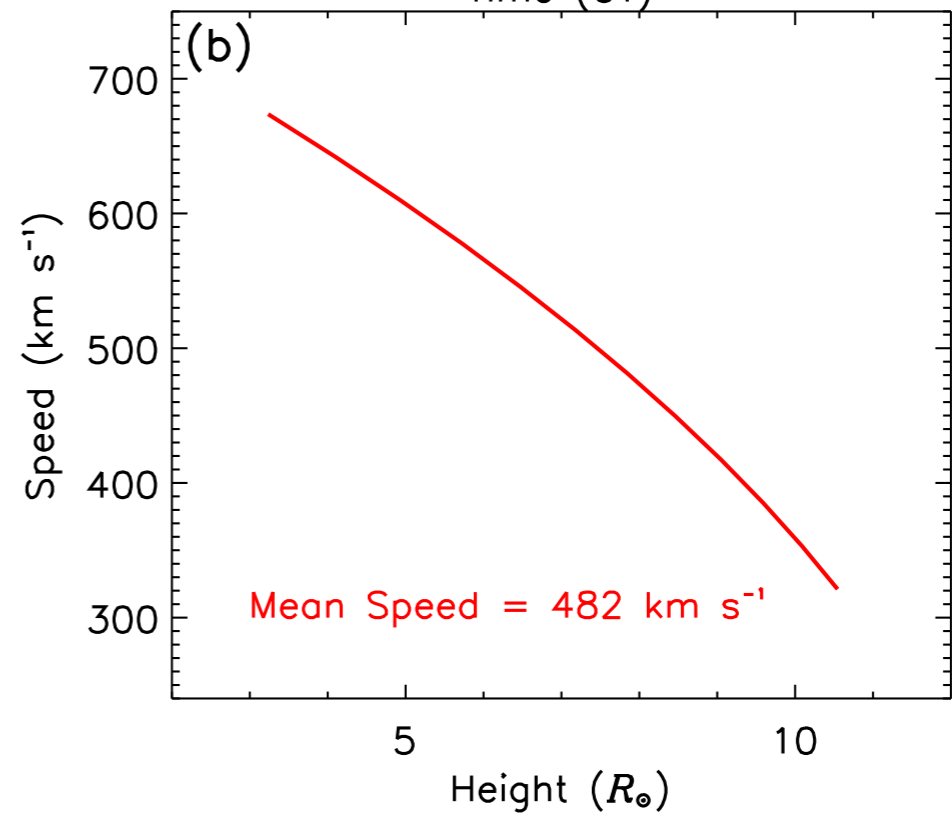
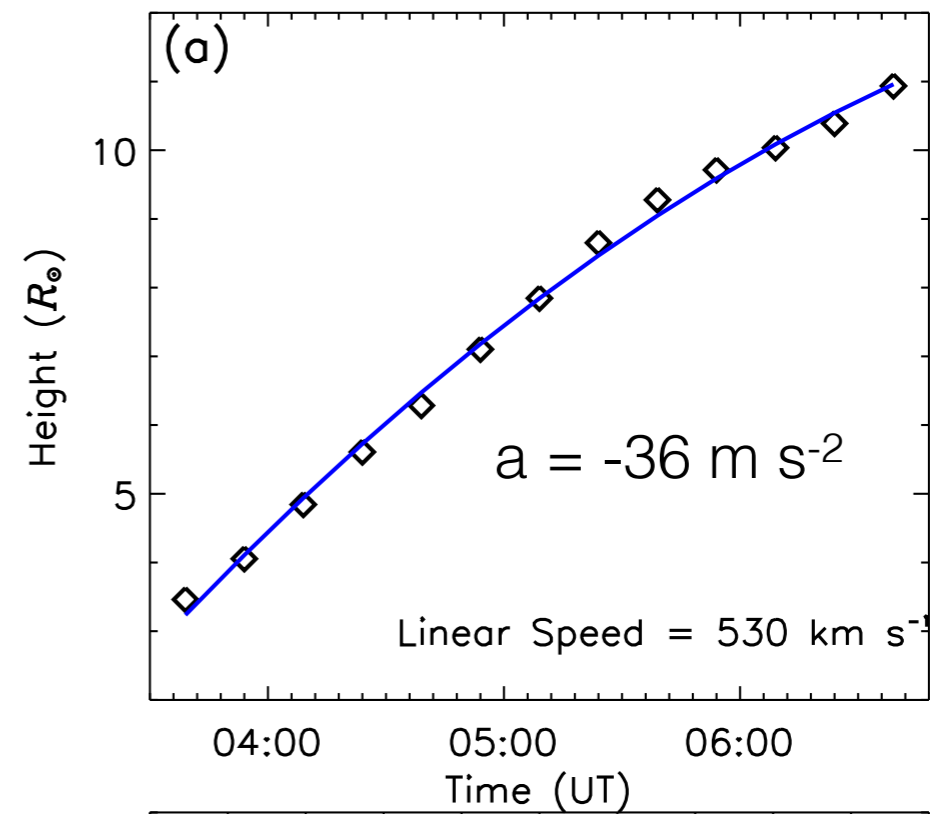
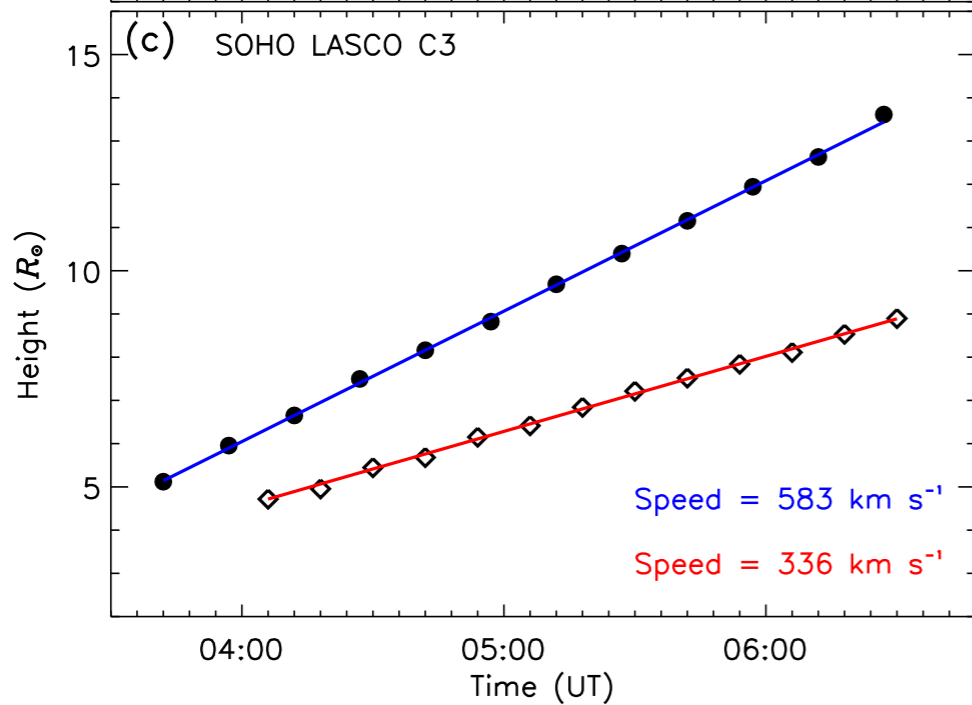
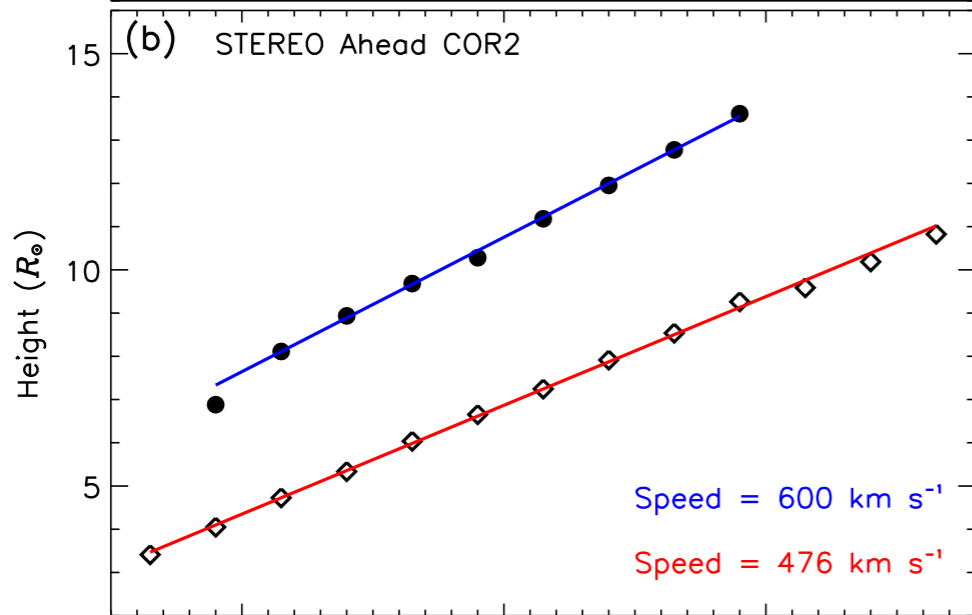
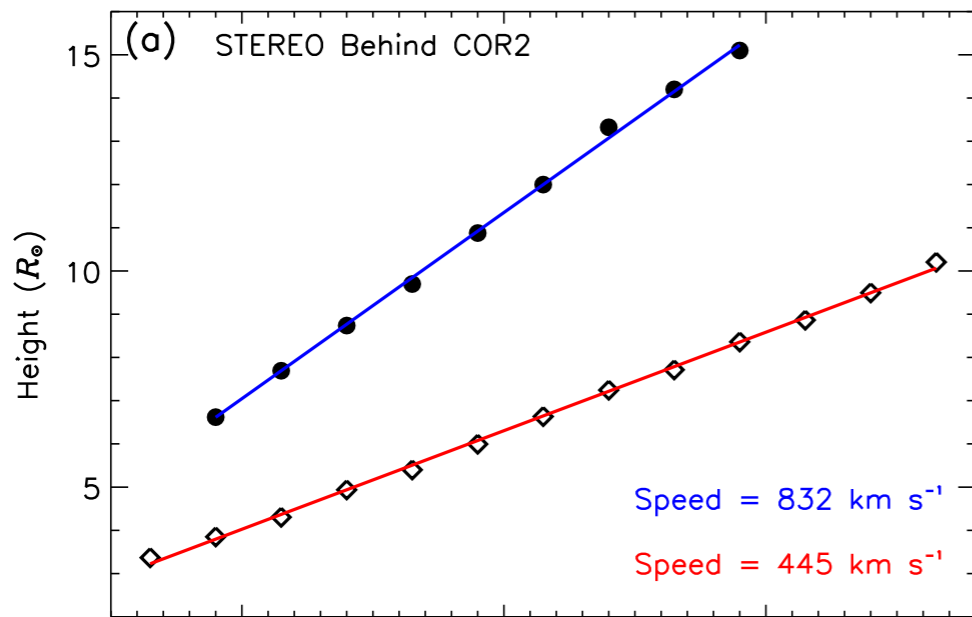








$-1 \ 0 \ 1$   
 $X (R_{\odot})$



Single angle observations => linear speed  
Reconstruction result => decelerated speed

# Summary

- multiple angles observations of the streamer deflection produced by a CME-driven shock is present, and the streamer deflection showed different shapes from different view angles.
- Direct interaction process between a CME-driven shock and a remote streamer is observed, and this process is used to determine the shock speed in the outer corona.
- the propagation of the streamer deflection is linearly based on every single angle observations. However, 3d reconstruction result suggests its deceleration property as it propagates outward.



Thanks