

SMEI direct observations and 3D-reconstruction measurements and their comparison with STEREO instrumentation

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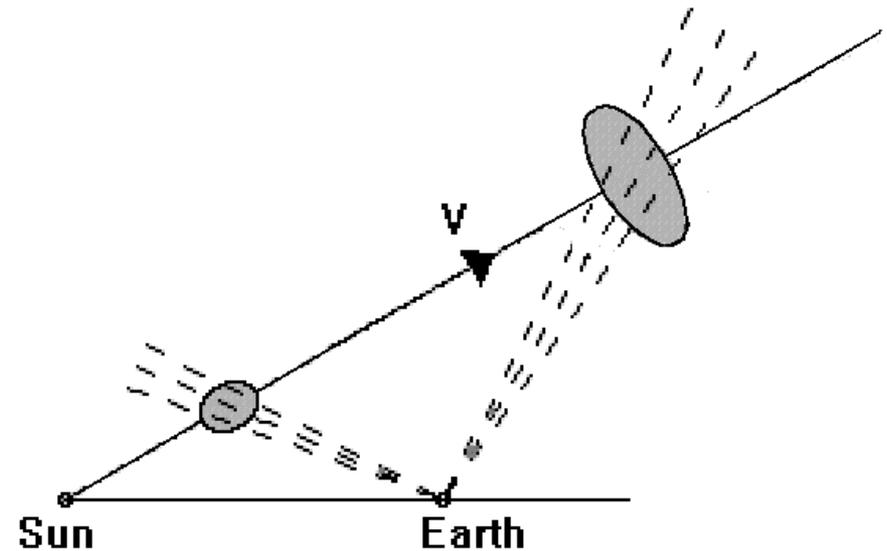
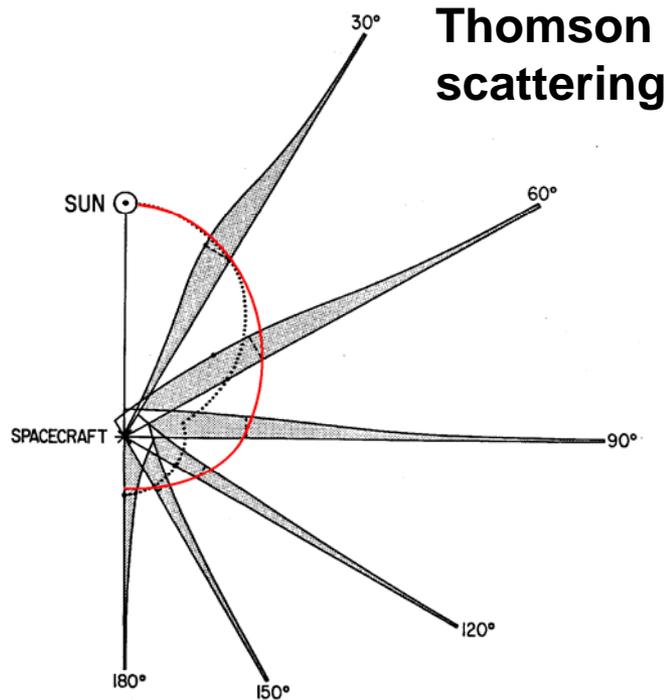
and

D.F. Webb

*Institute for Space Research, Boston College, Chestnut
Hill, MA*

Heliospheric C.A.T. Analyses

The outward-flowing solar wind structure follows very specific physics as it moves outward from the Sun

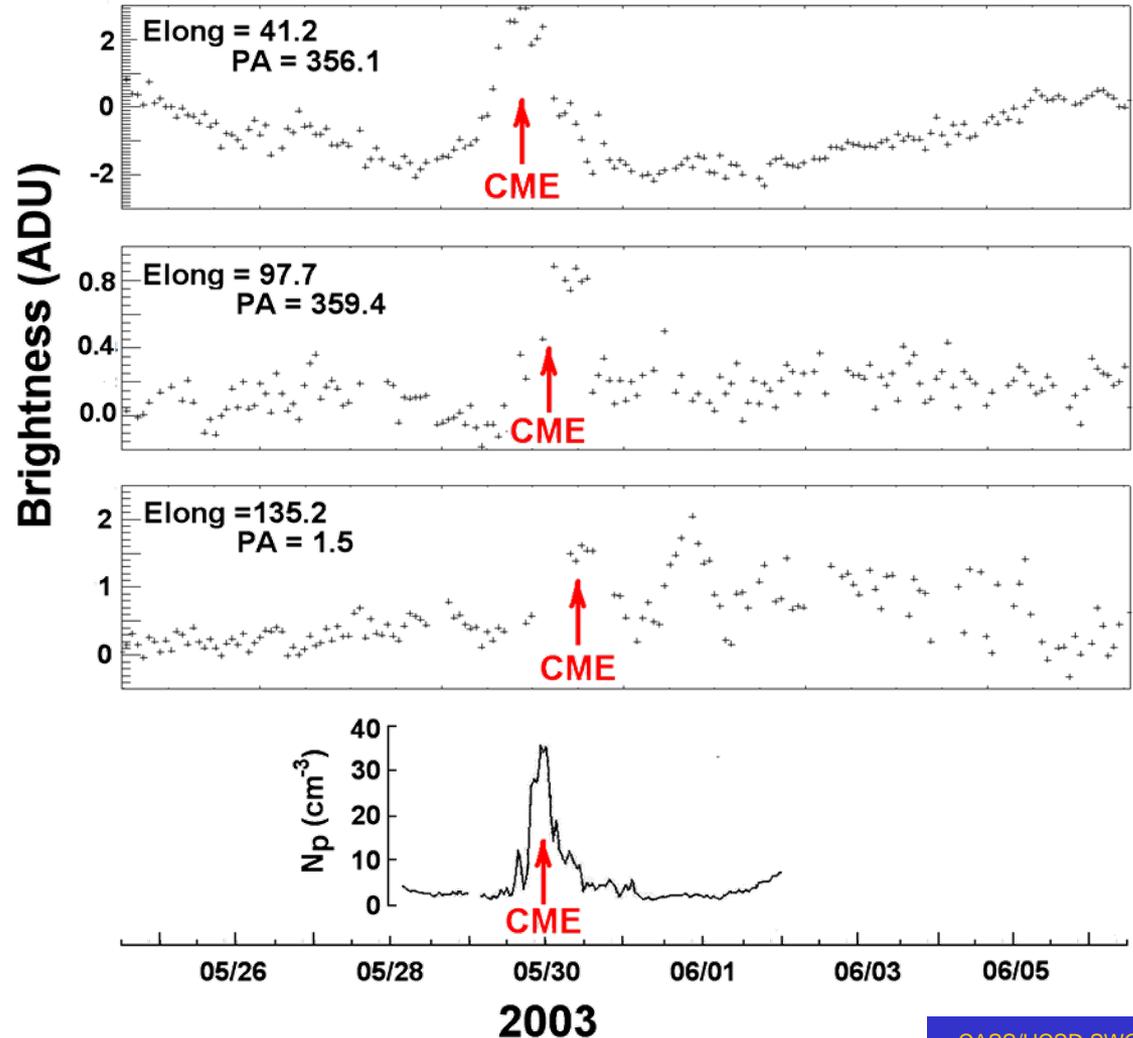


SMEI observations and comparison with STEREO

27-28 May 2003 CME events brightness time series for select sky sidereal locations

SMEI Brightness with a long-term (~30 day) base removed.

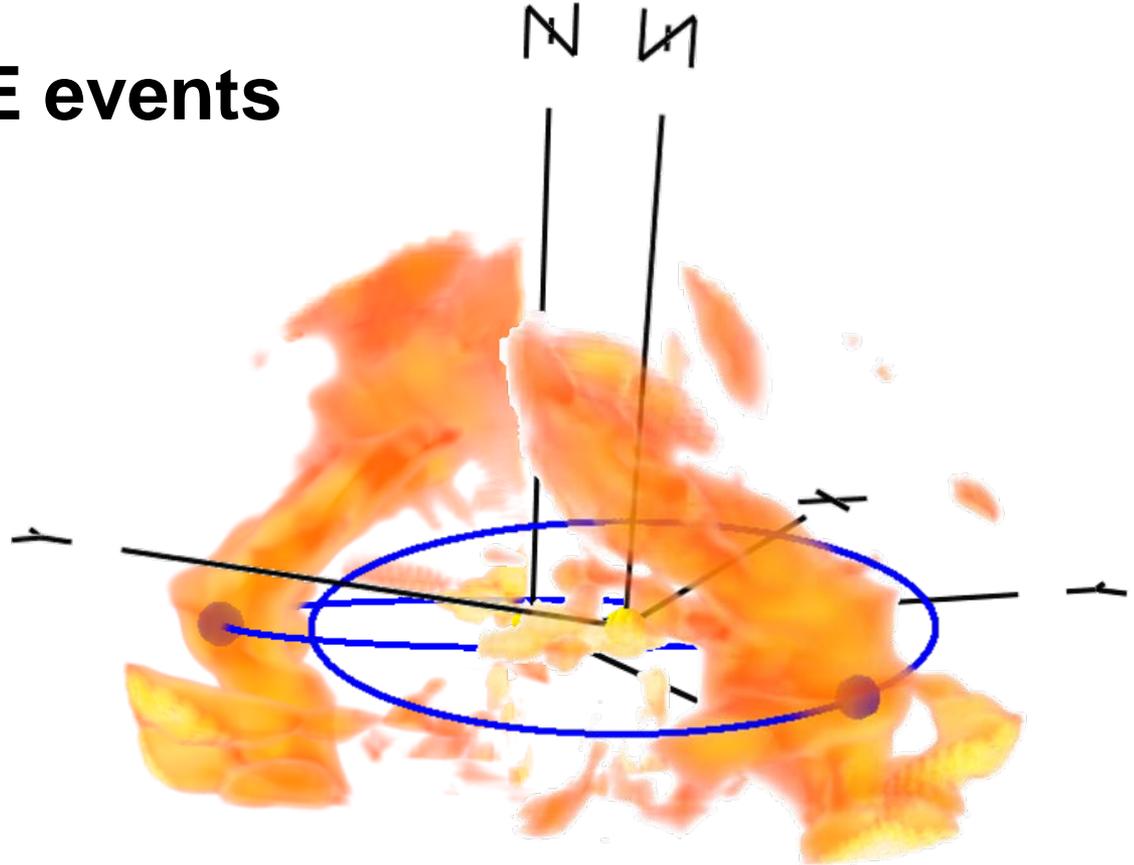
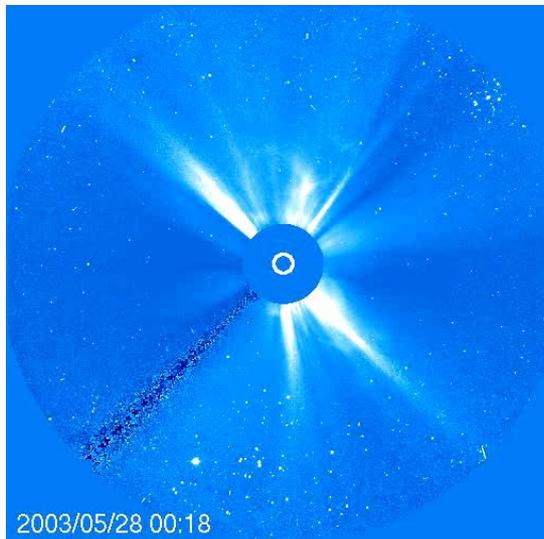
(1 S10 = 0.46 ± 0.02 ADU)



SMEI observations and comparison with STEREO

2003 May 27-28 CME events

SMEI density 3D reconstruction of the 28 May 2003 halo CME as viewed from 55° above the ecliptic plane about 90° West of the Sun-Earth line.



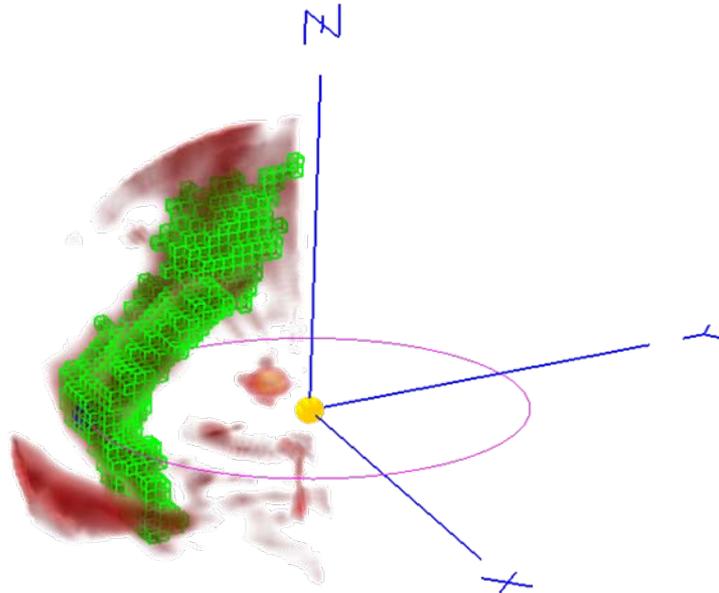
2003/05/30 00:00 UT

SMEI density (remote observer view)
of the 28 May 2003 halo CME

SMEI observations and comparison with STEREO

2003 May 27-28 CME events

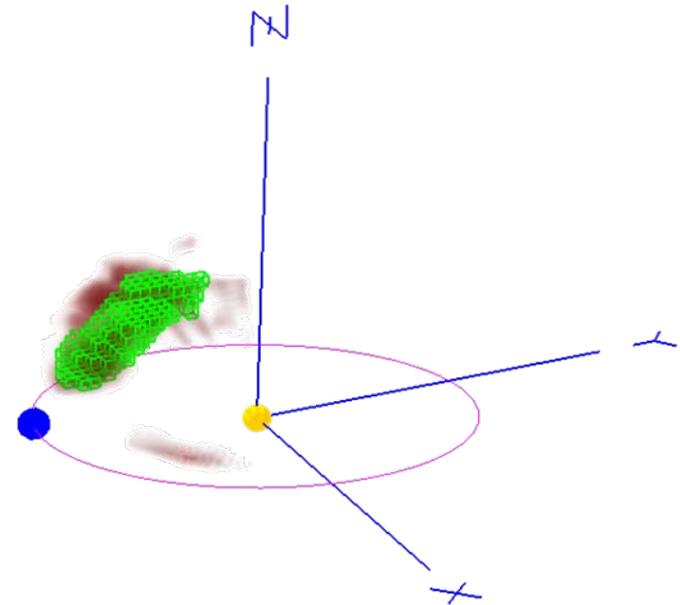
CME masses



Excess Mass(g): $1.844\text{E}+016$
Total Mass(g): $2.491\text{E}+016$
Ambient (g): $6.470\text{E}+015$
Energy (ergs): $3.448\text{E}+031$

2003/05/30 00:00 UT

Volume: 0.144 AU^3



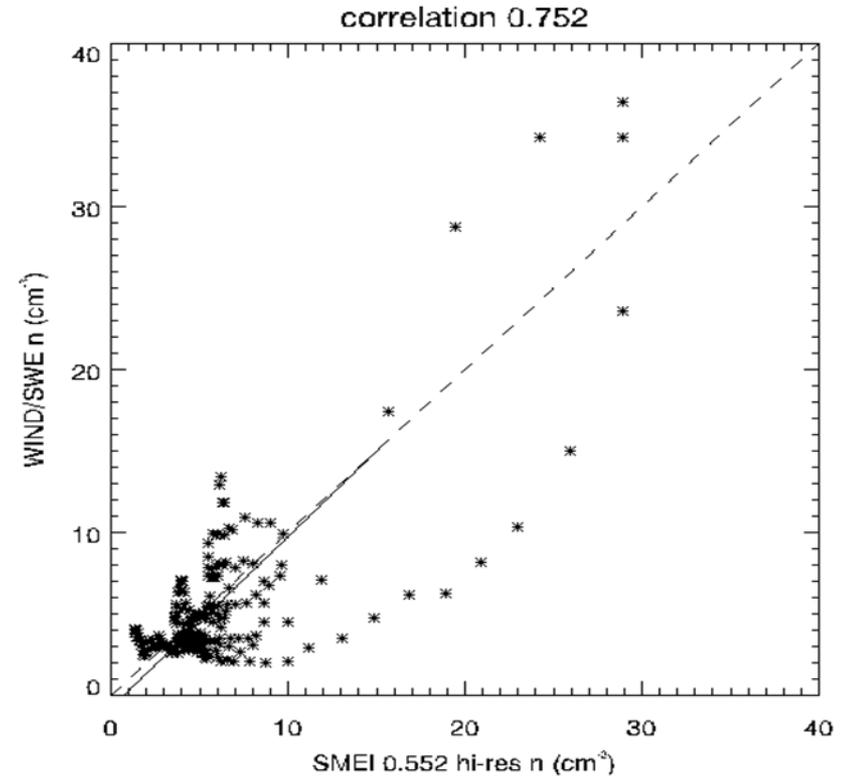
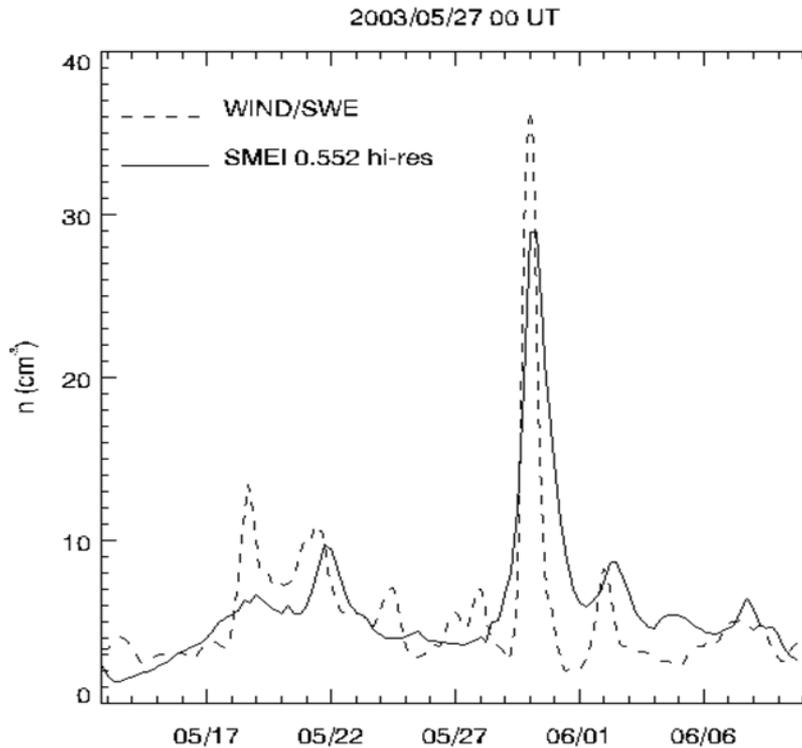
Excess Mass(g): $5.117\text{E}+015$
Total Mass(g): $6.921\text{E}+015$
Ambient (g): $1.804\text{E}+015$
Energy (ergs): $8.759\text{E}+030$

2003/05/30 00:00 UT

Volume: 0.030 AU^3

SMEI observations and comparison with STEREO

27-28 May 2003 CME events mapped to *in-situ* Wind spacecraft measurements (CR 2003)

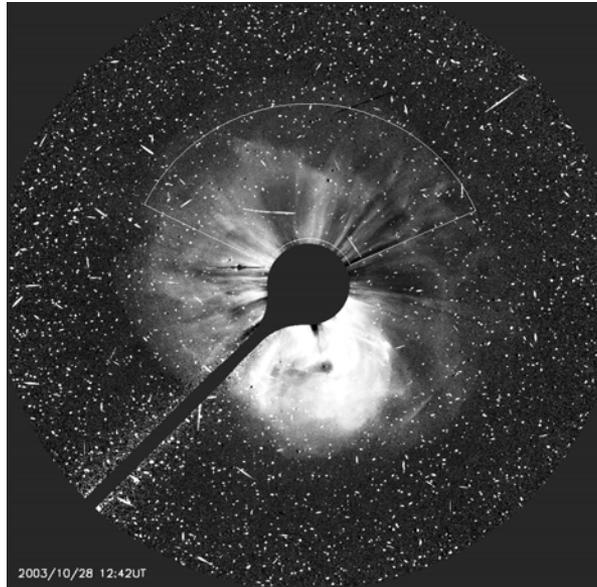


SMEI proton density 3D reconstruction of the 28 May 2003 halo CME compared with Wind

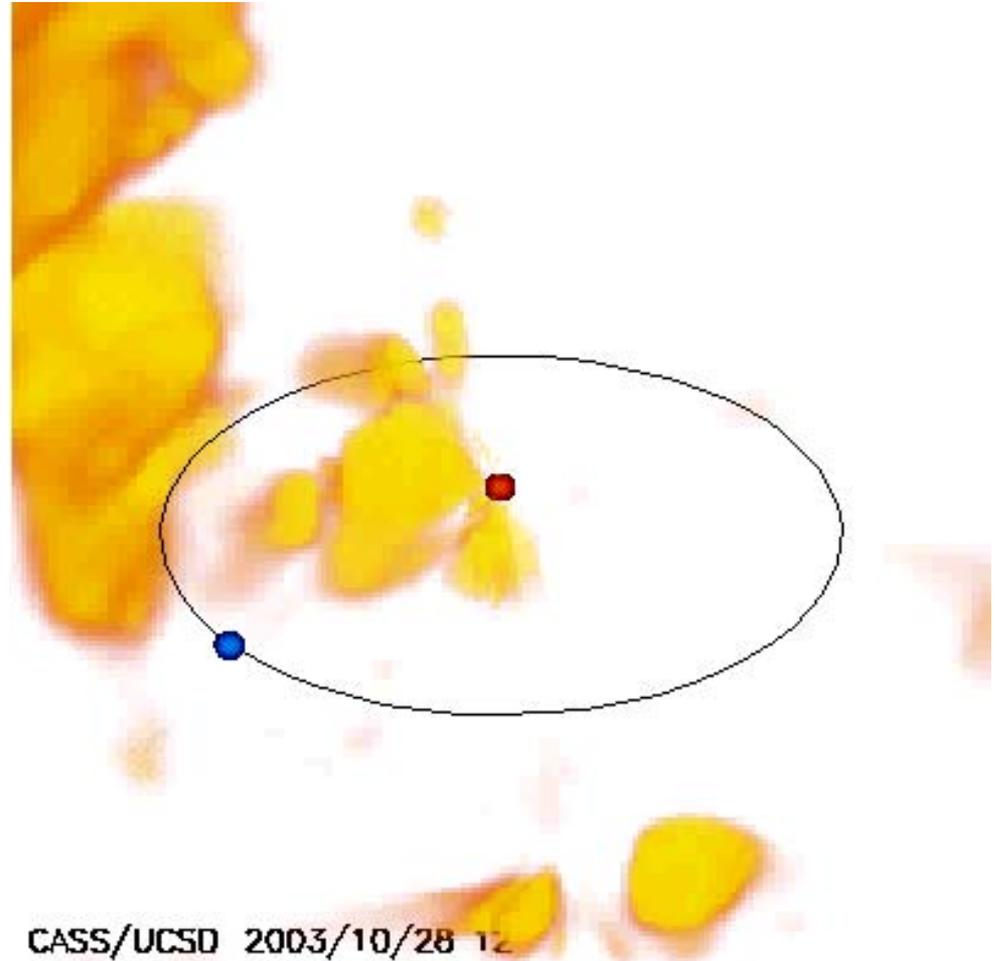
SMEI observations and comparison with STEREO

SMEI 3D reconstruction of the October 28 CME.

Mass determination $\sim 6.7 \times 10^{16} \text{g}$ excess and $8.3 \times 10^{16} \text{g}$ total for northward directed structure within the $10 \text{ e}^- \text{cm}^{-3}$ contour.



The above structure has a mass of about $0.5 \times 10^{16} \text{g}$ excess in the sky plane but $\sim 2.0 \times 10^{16} \text{g}$ excess at 60° (Vourlidas, private communication, 2004).

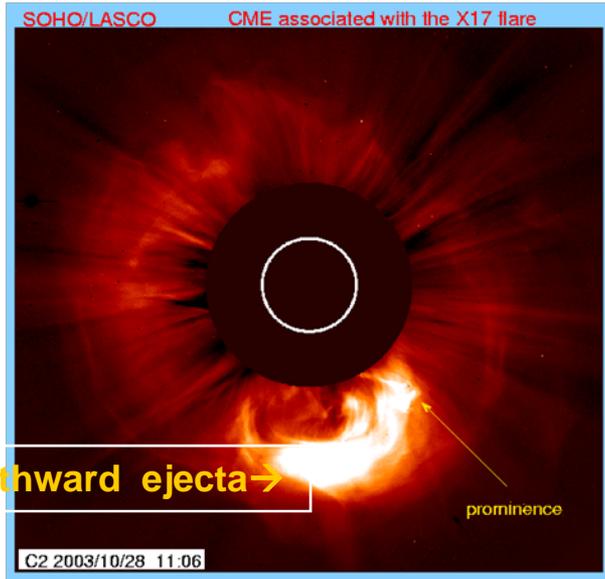


SMEI C.A.T. Analysis

SMEI observations and comparison with STEREO

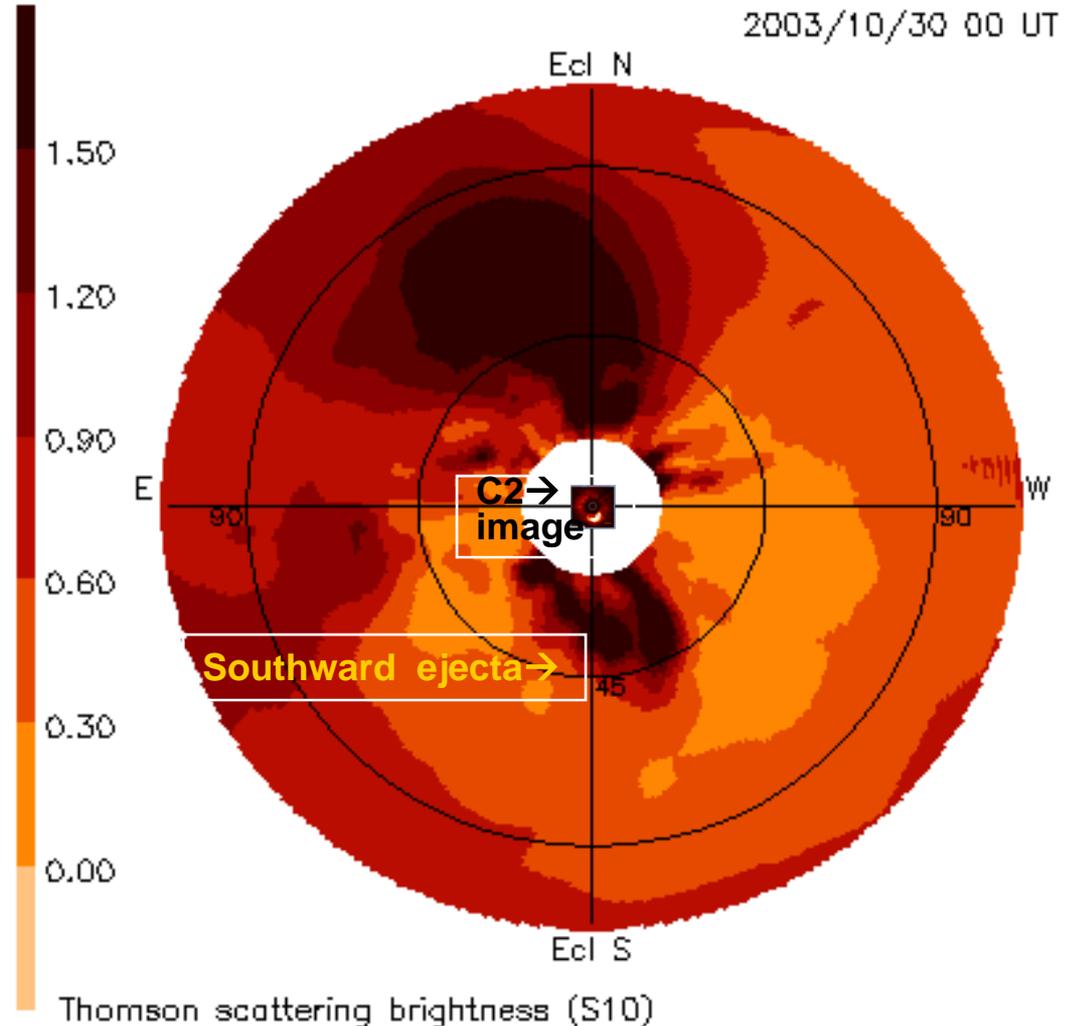
2003 October 28 CME

Northeast-directed ejecta is more-nearly earth-directed



LASCO C2 CME image to 6 Rs.

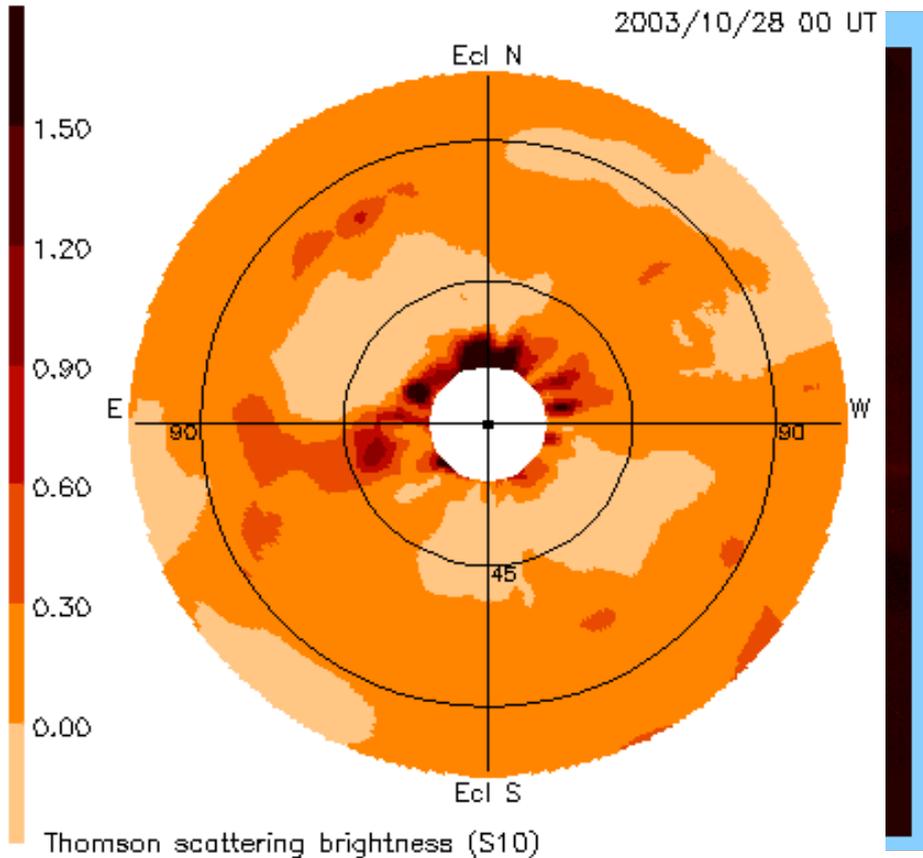
SMEI enhanced Sky Map image and animation to 110° elongation.



SMEI C.A.T. Analysis

SMEI observations and comparison with STEREO

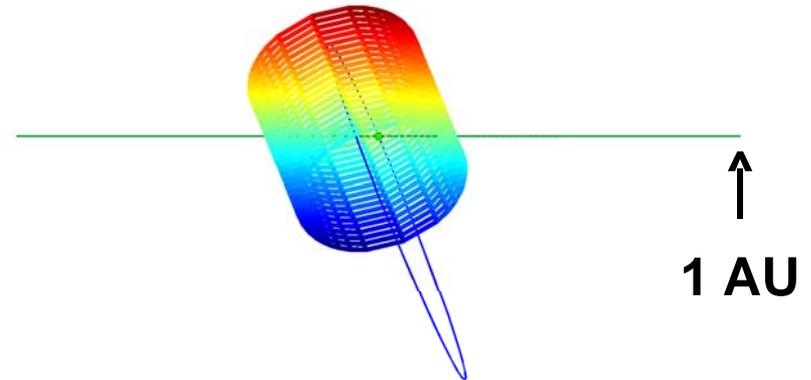
2003 October 28 CME



SMEI Sky Map Dragnee 110°
image to 6 Rs.

By the way!

2003/10/30 00 UT

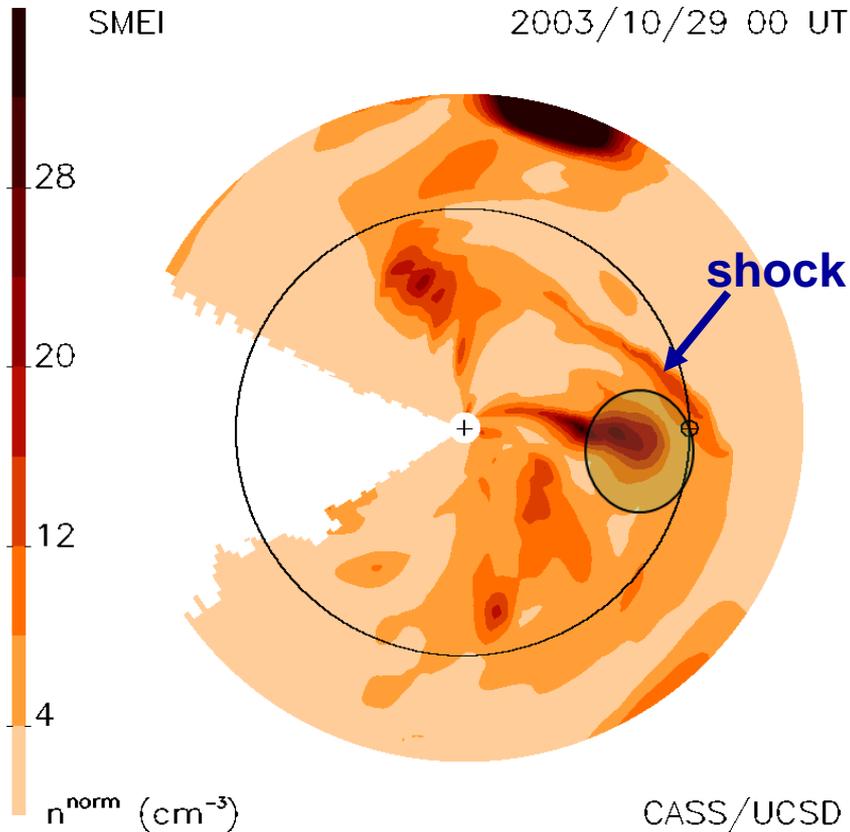


“B” fit of the 28 October
2003 CME Magnetic loop
analysis by T. Mulligan

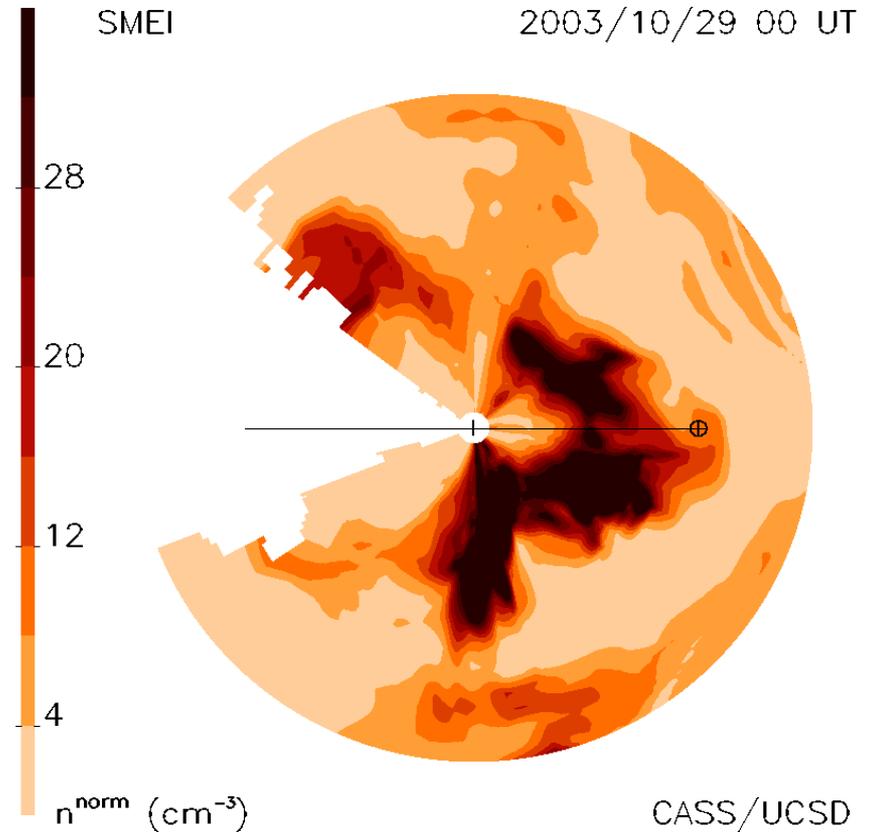
SMEI observations and comparison with STEREO

Recent higher-resolution SMEI PC 3D reconstructions show the CME sheath region as well as the central dense core

2003 October 28 CME higher-resolution analysis



Ecliptic cut

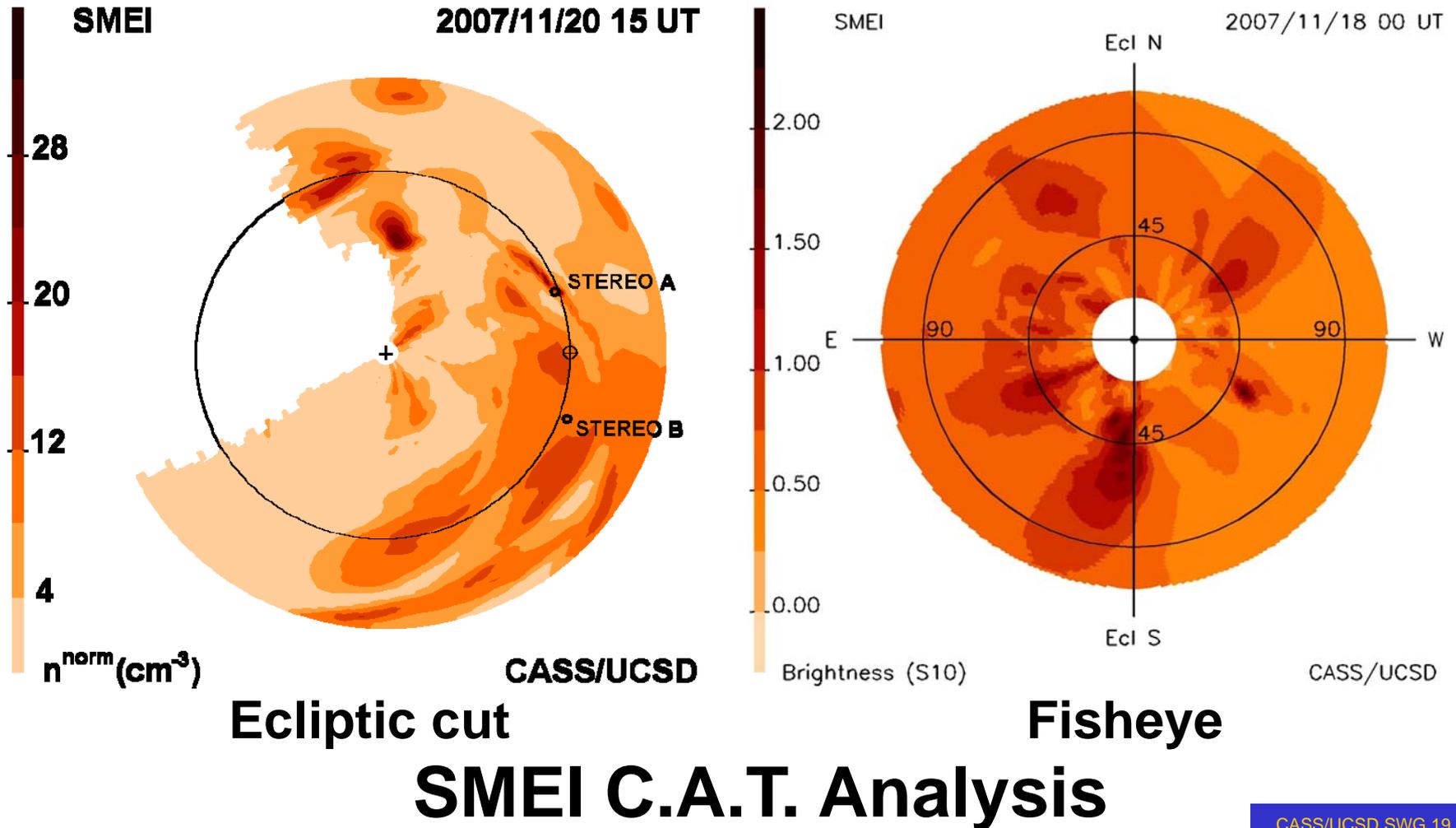


Meridional cut

SMEI C.A.T. Analysis

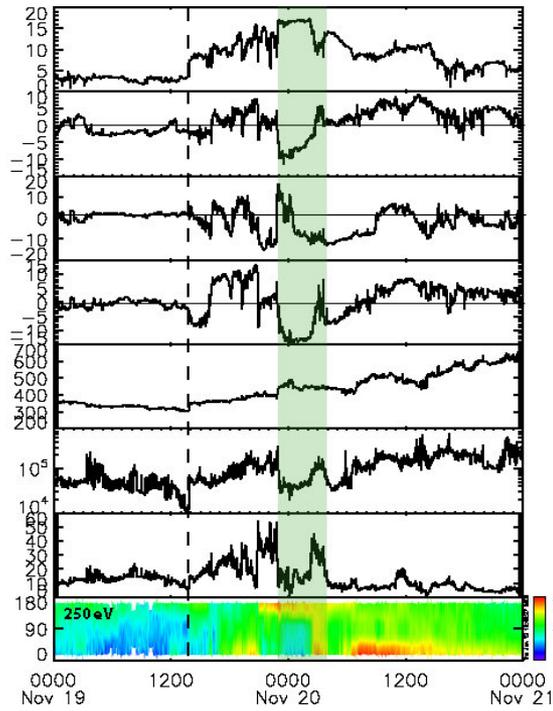
SMEI observations and comparison with STEREO

20 November 2007 CME higher- resolution analysis

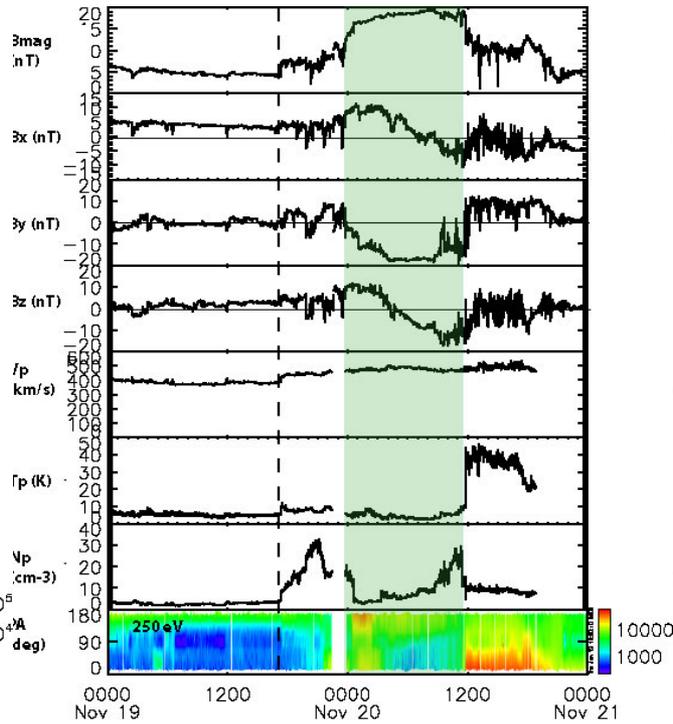


SMEI observations and comparison with STEREO

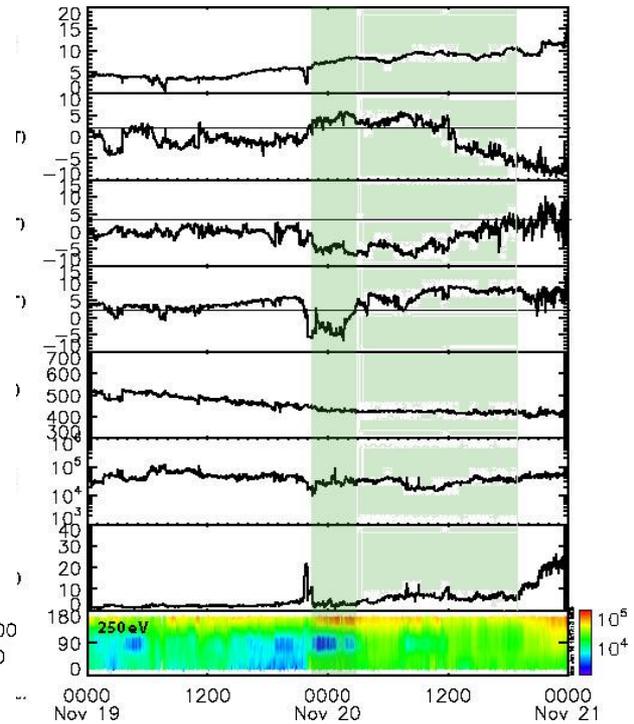
20 November 2007 CME *in situ* analysis



STEREO B



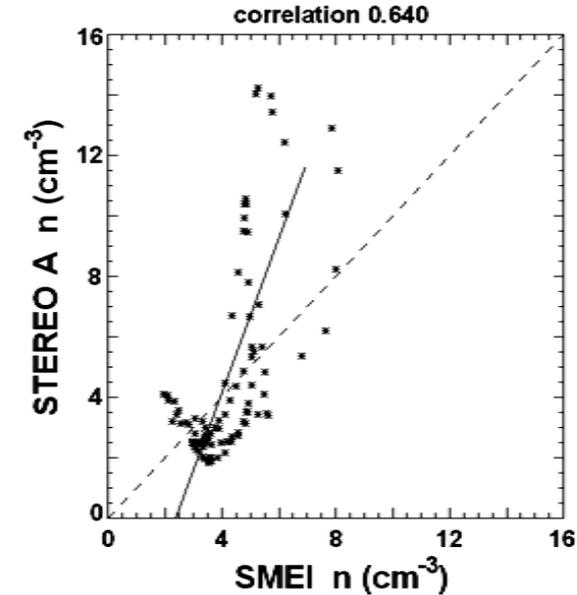
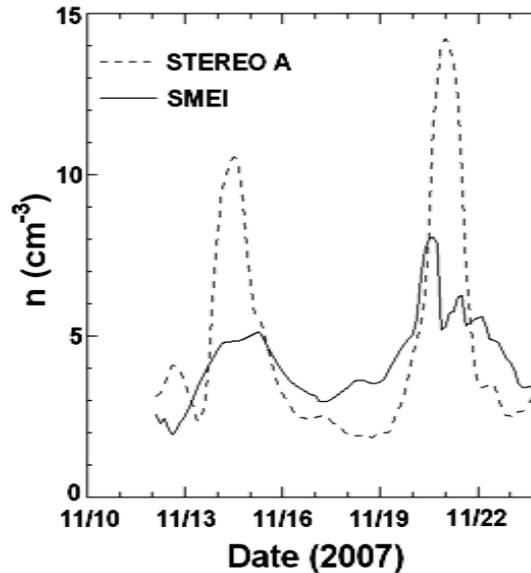
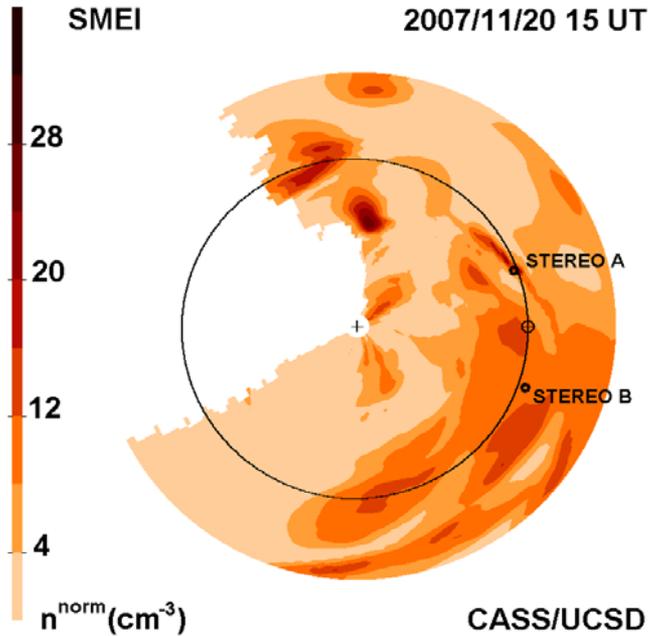
Wind



STEREO A

SMEI observations and comparison with STEREO

20 November 2007 CME higher- resolution analysis



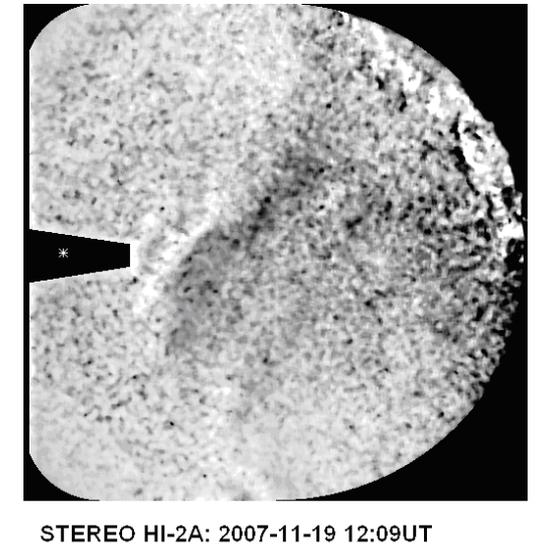
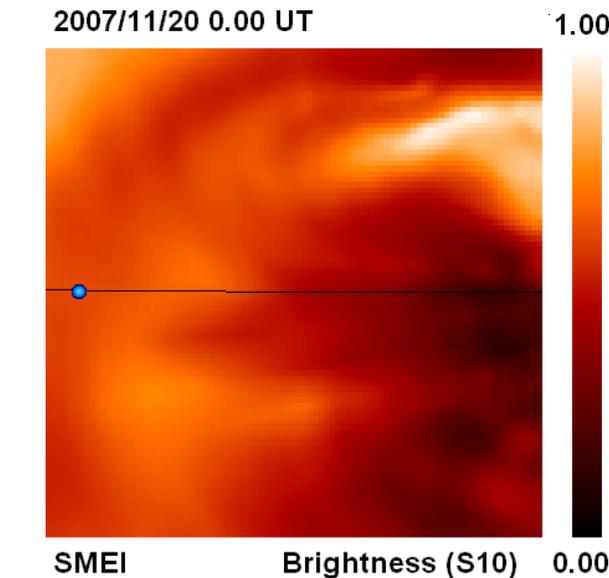
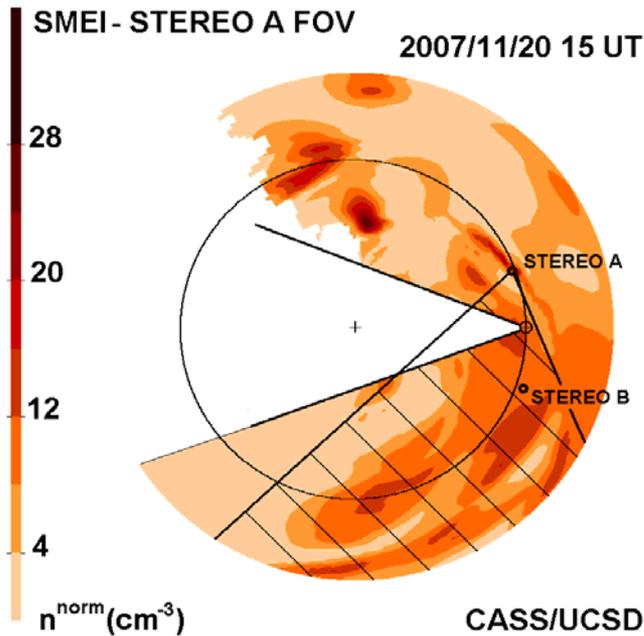
SMEI-derived
Ecliptic cut

In-situ example 3D reconstruction
at STEREO A

SMEI C.A.T. Analysis

SMEI observations and comparison with STEREO

Comparison views of SMEI 3D reconstruction and STEREO HI-2A view



**SMEI - STEREO A
ecliptic cut coverage**

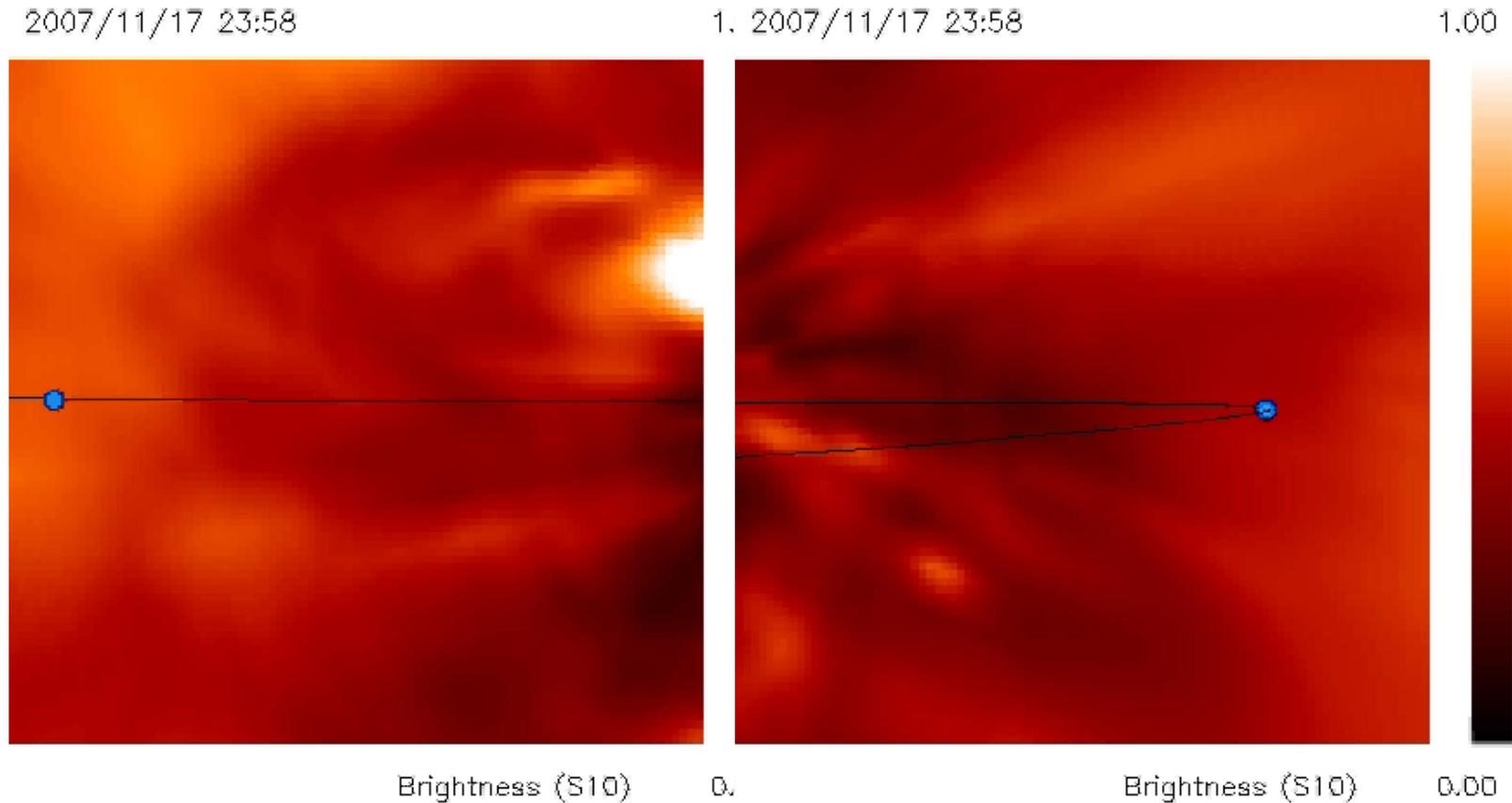
**SMEI 3D
reconstruction
of the STEREO A
view**

**STEREO A image
with a combined
image average
subtracted**

SMEI C.A.T. Analysis

SMEI observations and comparison with STEREO

SMEI View From STEREO HI 2's 20 November 2007 SMEI analysis



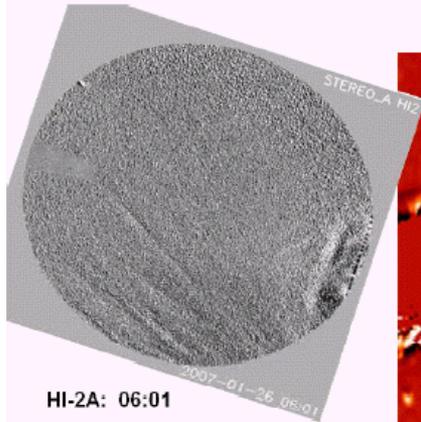
STEREO A view

STEREO B view

SMEI C.A.T. Analysis

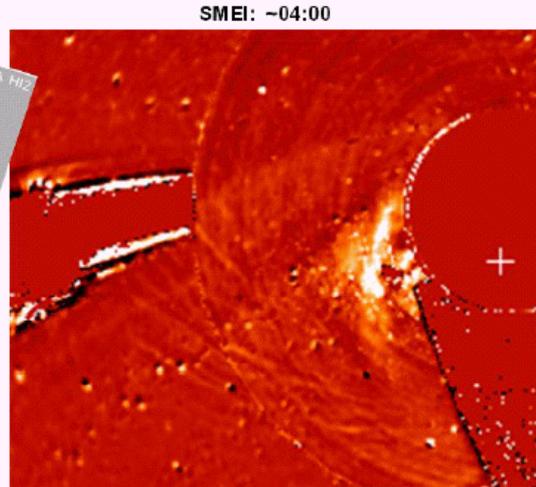
SMEI observations and comparison with STEREO

SMEI and STEREO HI 2 Comparison 24-25 January 2007 CME analysis

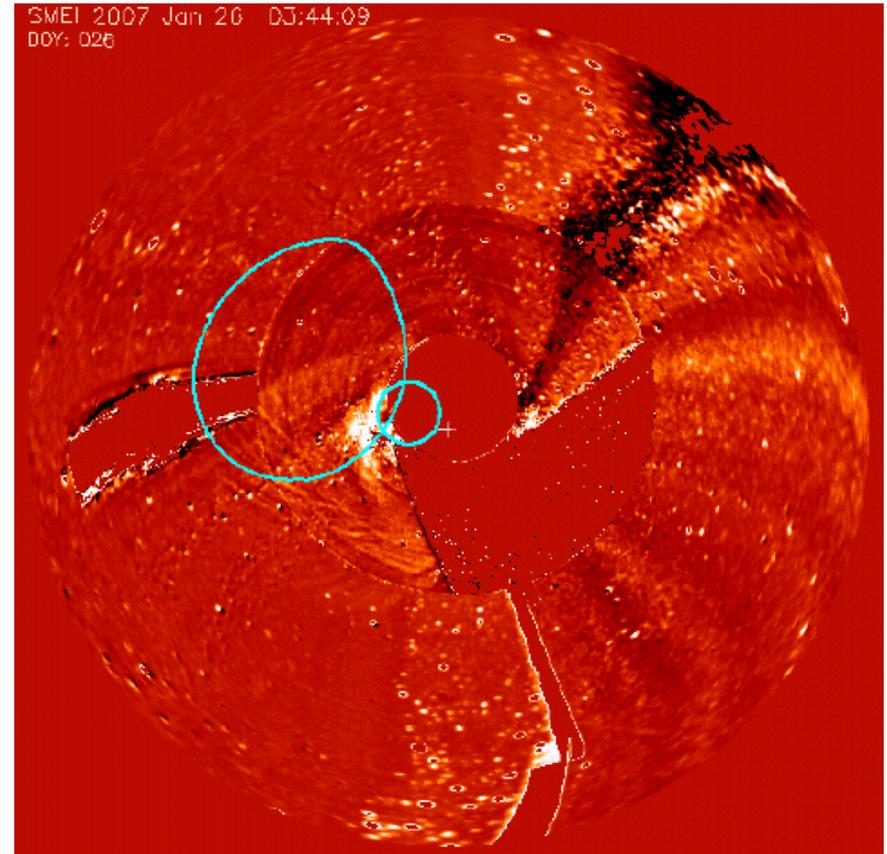


HI-2A: 06:01

STEREO A HI-2



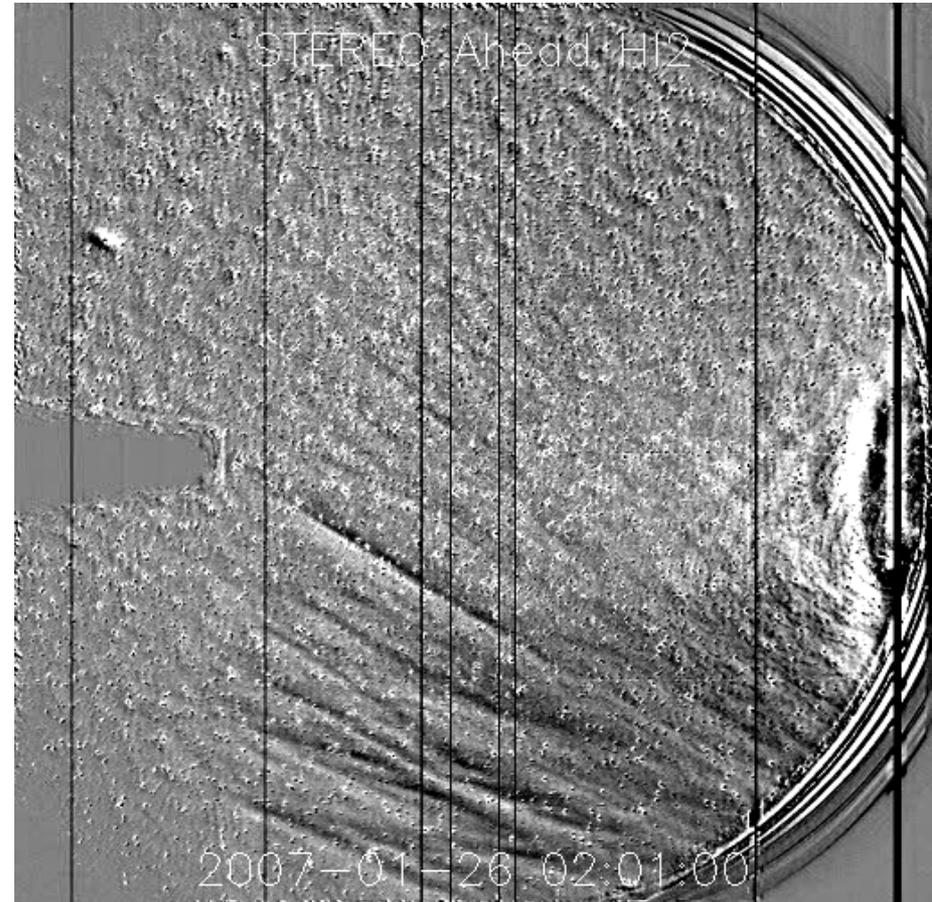
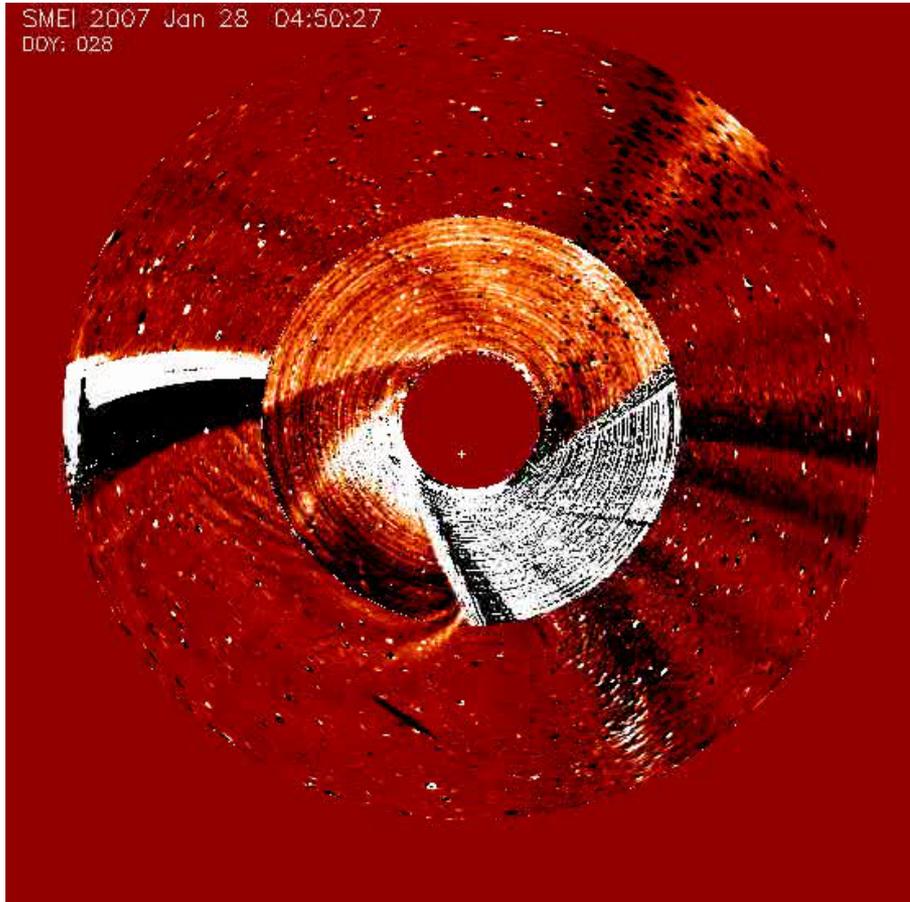
SMEI



“Study of CME Propagation in the Inner Heliosphere: SMEI and STEREO HI Observations of the January 2007 Events”, D. F. Webb¹, T. A. Howard, C. D. Fry, T. A. Kuchar¹, D. Odstrcil, B. V. Jackson, M. M. Bisi, R. A. Harrison, J. S. Morrill, R. A. Howard, and J. C. Johnston (Solar Phys. submitted)

SMEI observations and comparison with STEREO

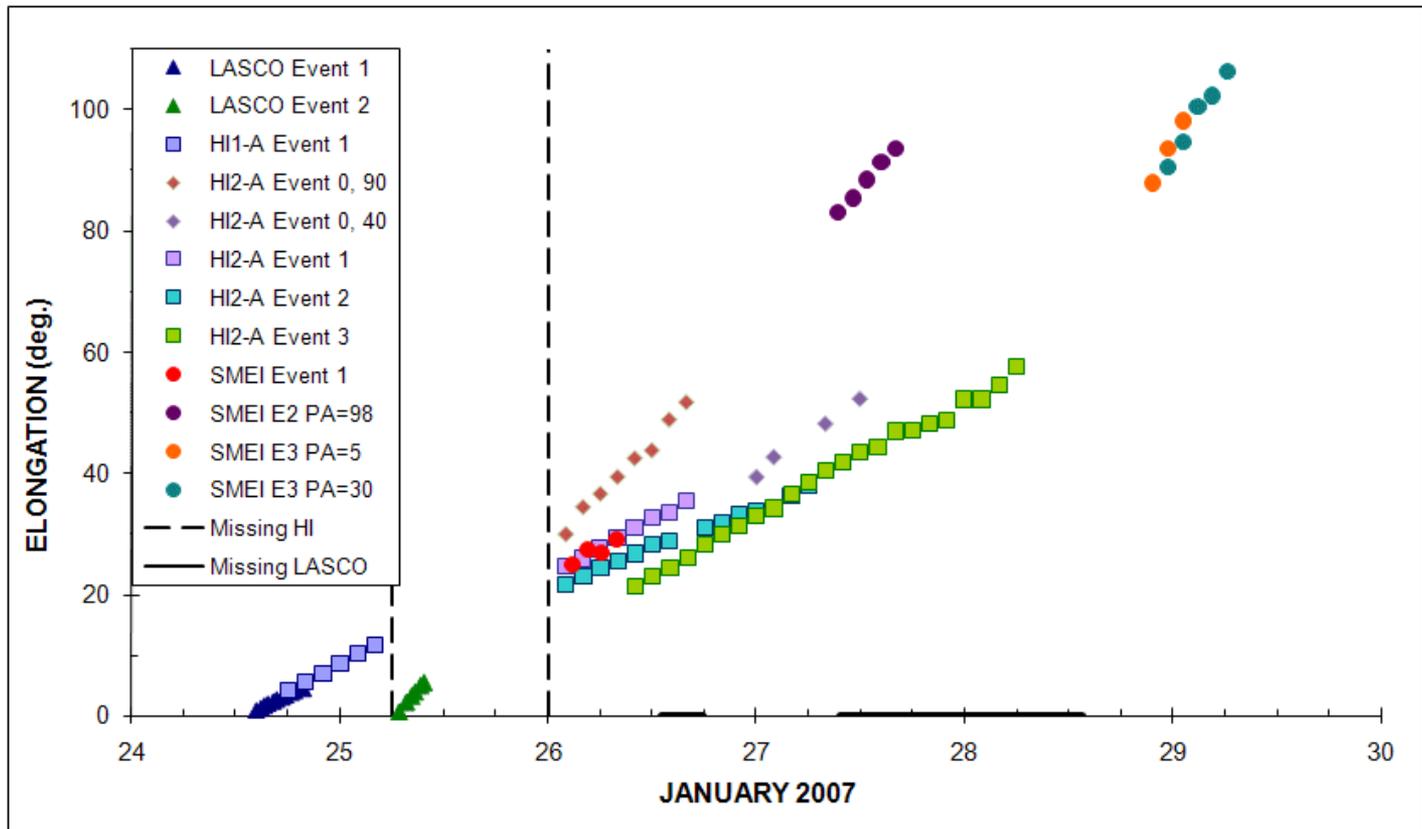
SMEI and STEREO HI 2 Comparison 24-25 January 2007 CME analysis



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SMEI observations and comparison with STEREO

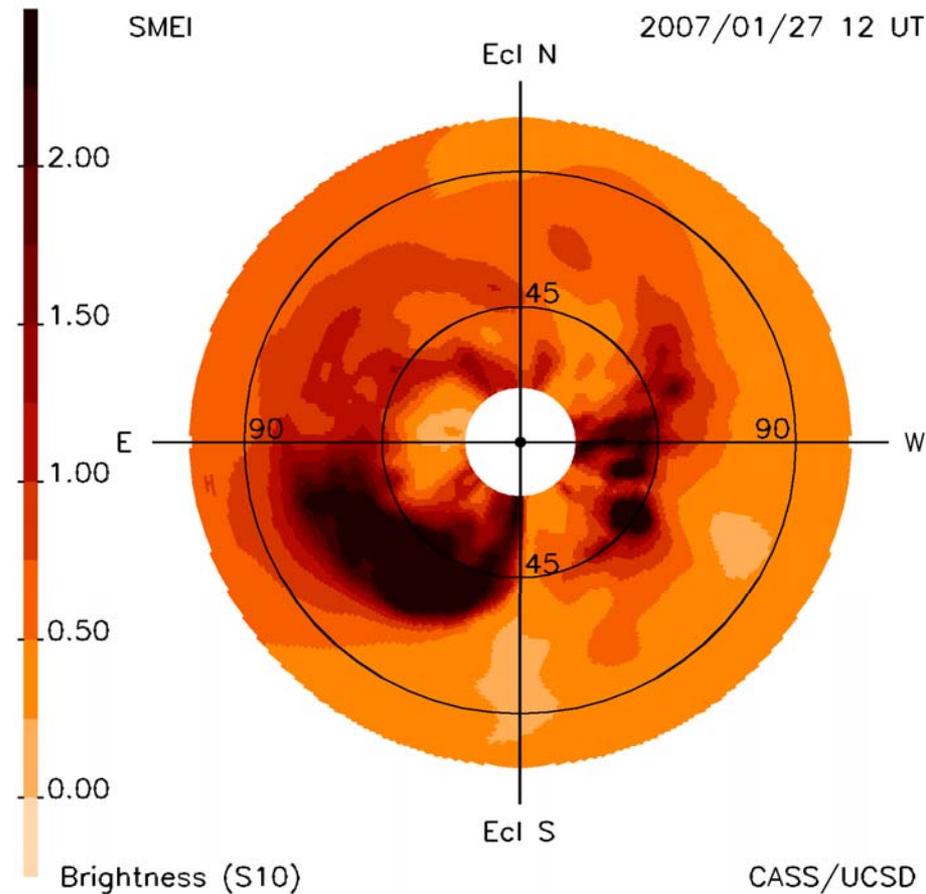
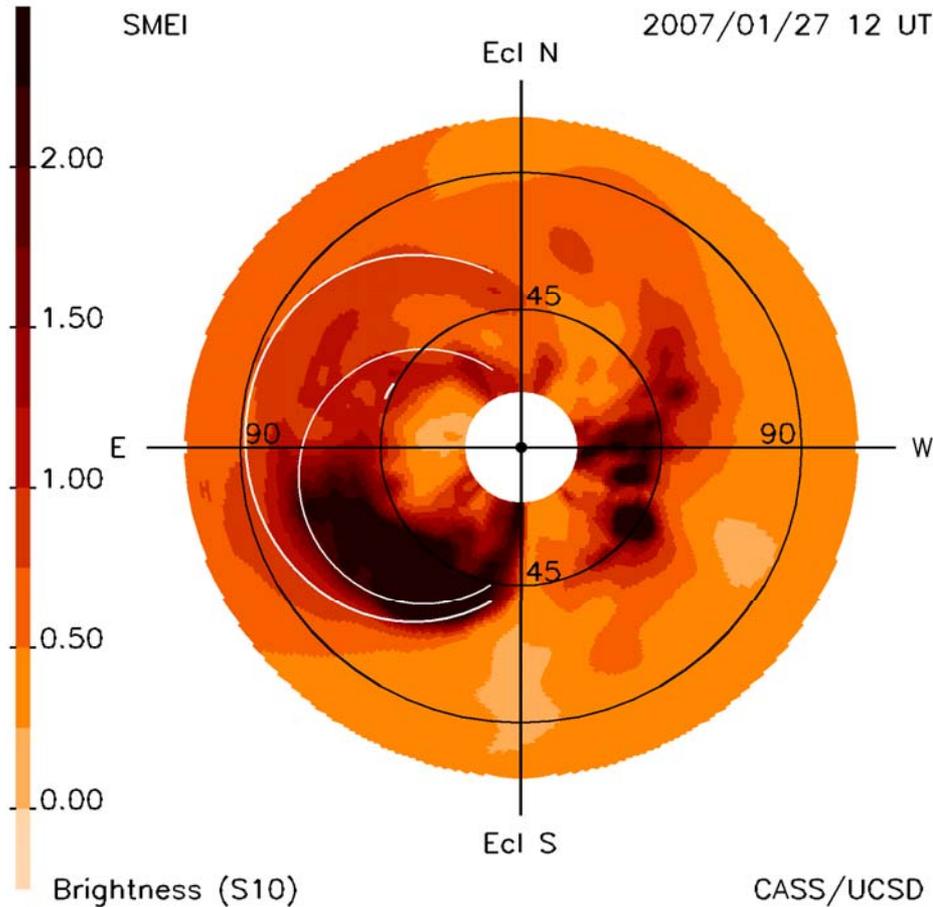
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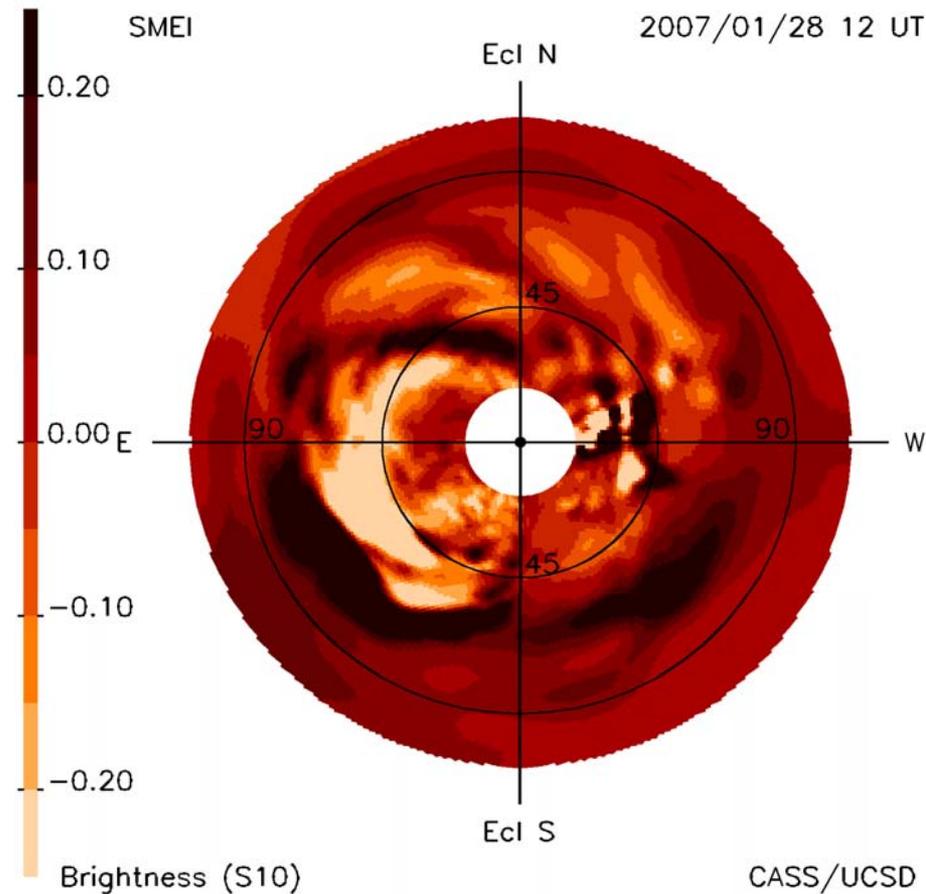
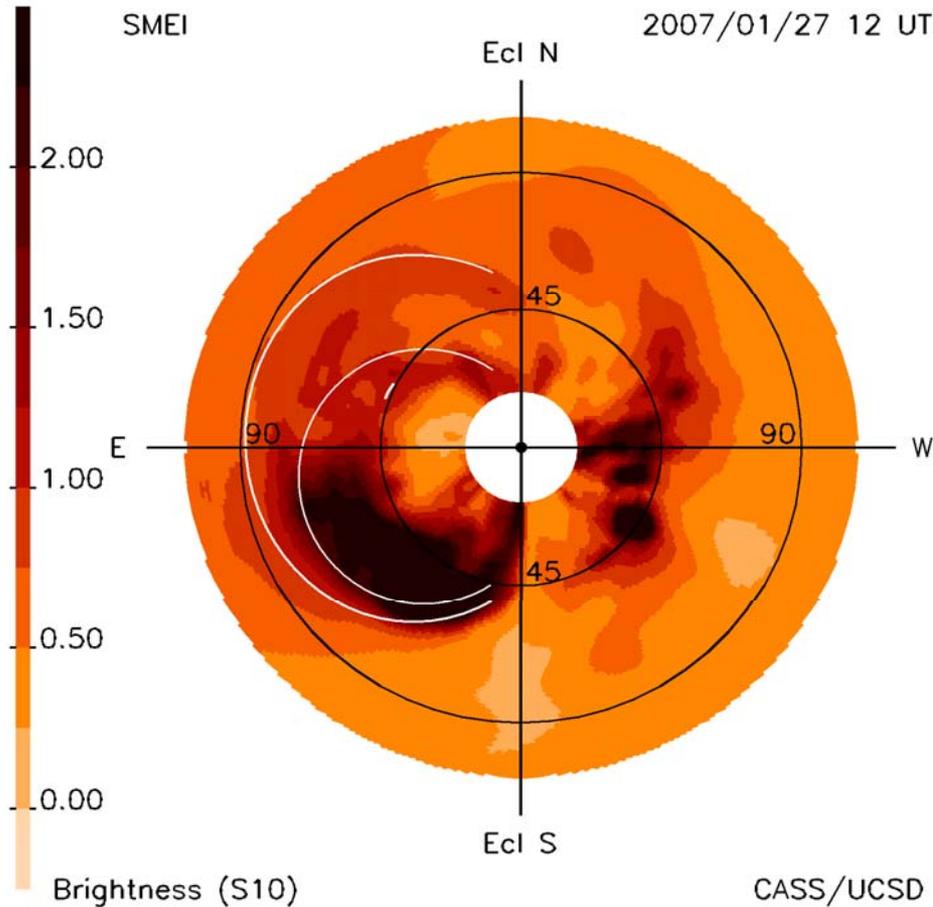
SMEI observations and comparison with STEREO

SMEI and STEREO HI 2 Comparison 24-25 January 2007 CME analysis



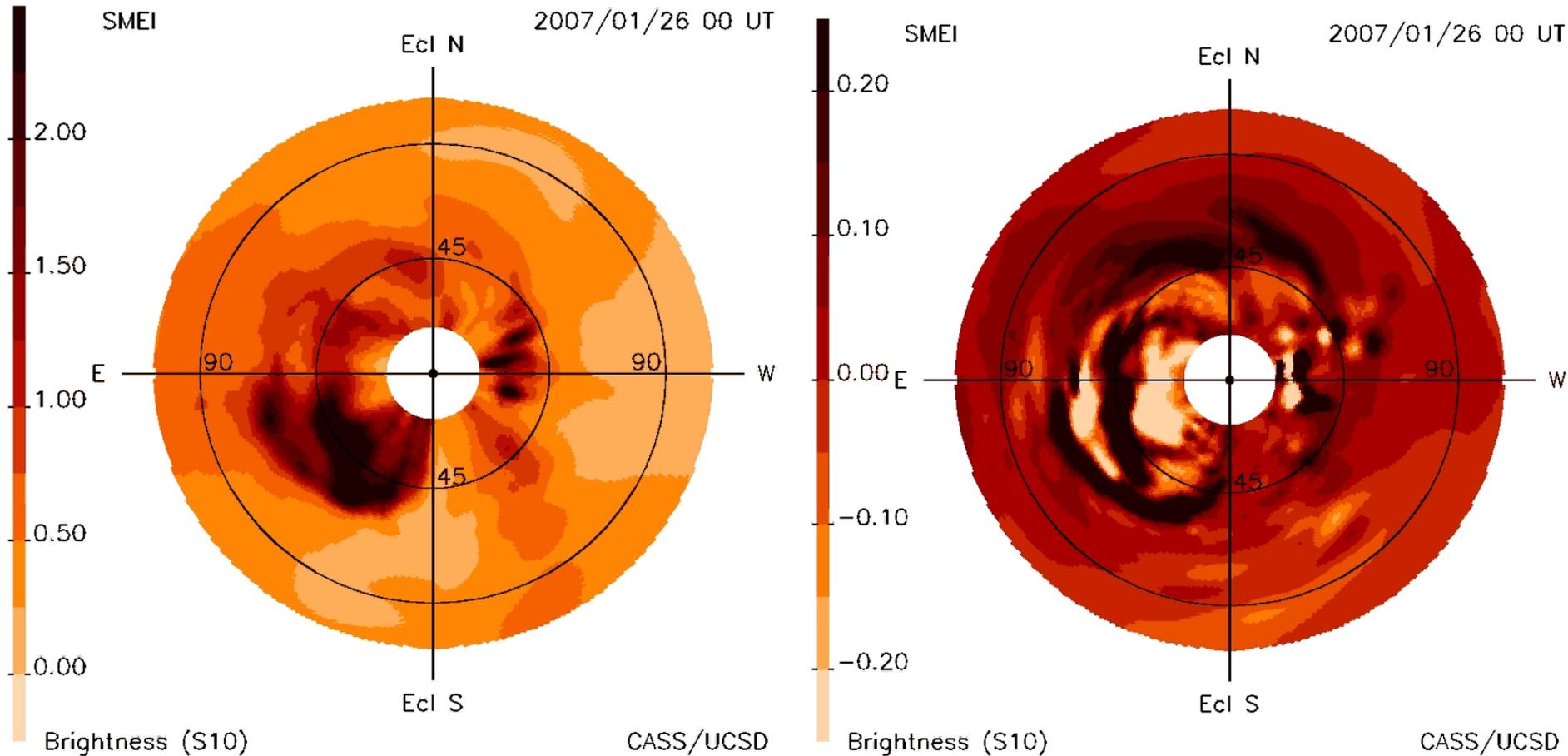
SMEI observations and comparison with STEREO

SMEI and STEREO HI 2 Comparison 24-25 January 2007 CME analysis



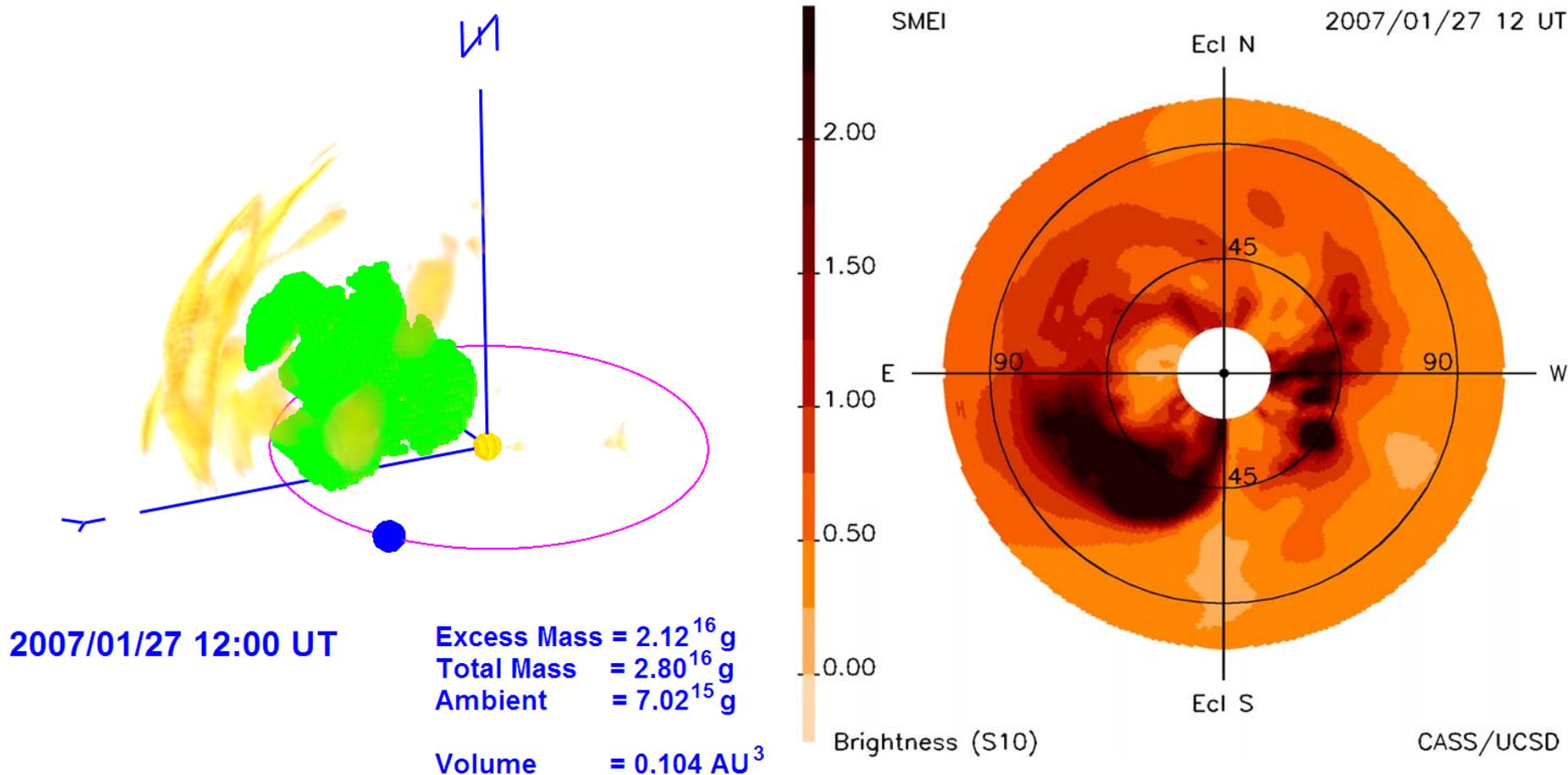
SMEI observations and comparison with STEREO

SMEI and STEREO HI 2 Comparison 24-25 January 2007 CME analysis



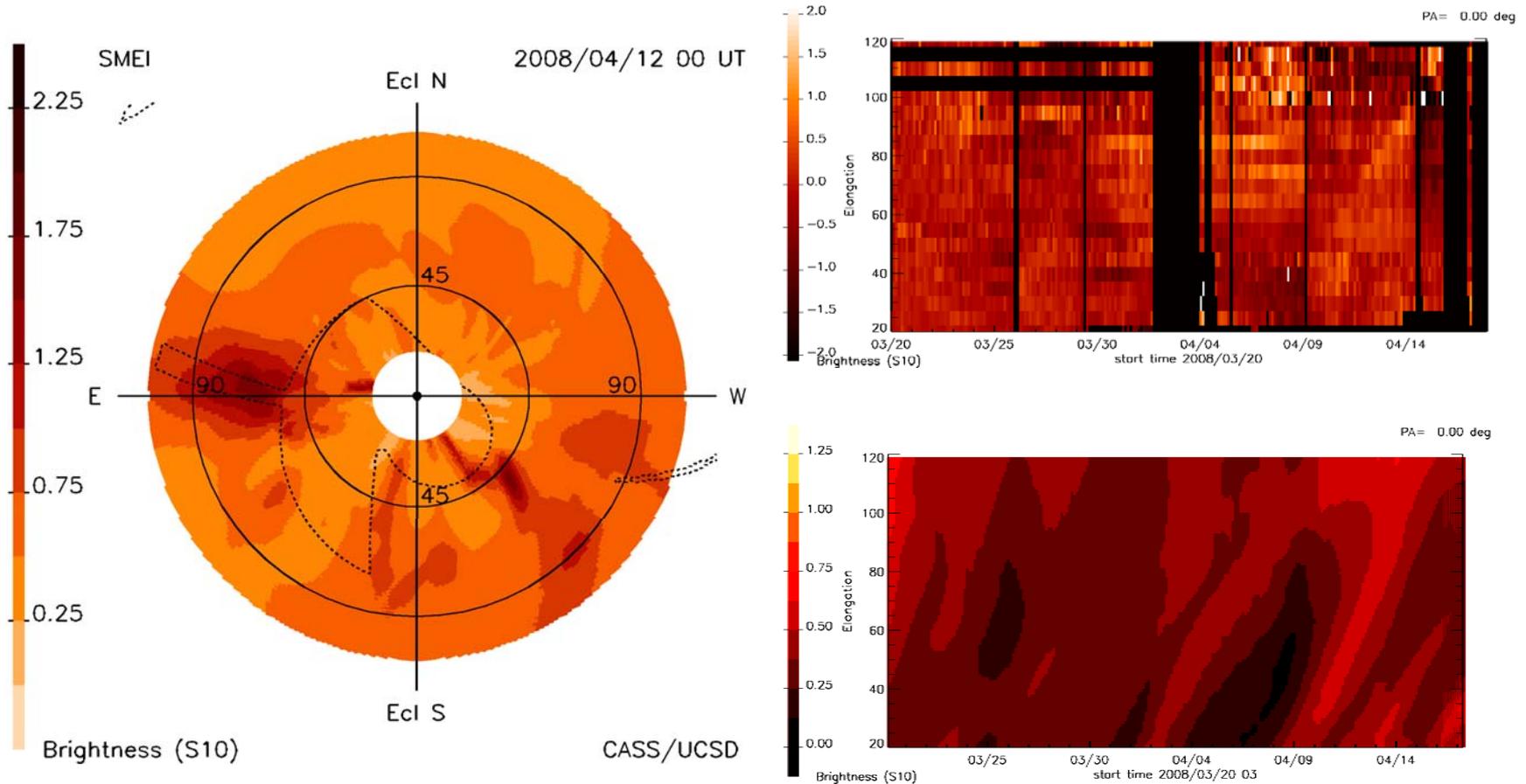
SMEI observations and comparison with STEREO

SMEI and STEREO HI 2 Comparison 24-25 January 2007 CME analysis



SMEI observations and comparison with STEREO

SMEI and STEREO HI 2 Comparison WHI March-April 2008 analysis

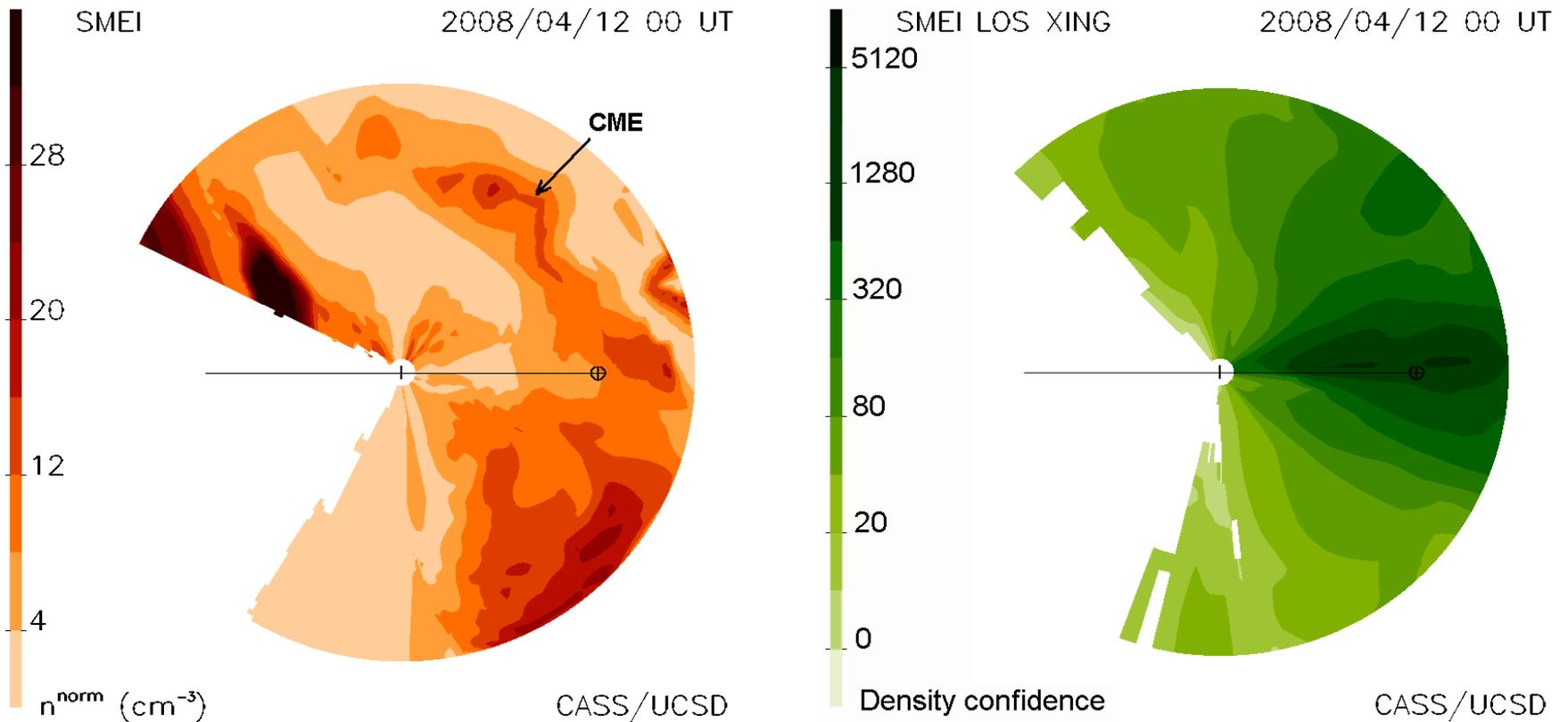


WHI

“Low resolution STELab IPS 3D Reconstructions of the Whole Heliospheric Interval and Comparison with in-Ecliptic Solar Wind Measurements from STEREO and Wind Instrumentation”, M. M. Bisi, B.V. Jackson, A. Buffington, J.M. Clover, P.P. Hick, M. Tokumaru (Solar Phys. submitted)

SMEI observations and comparison with STEREO

SMEI and STEREO HI 2 Comparison WHI March-April 2008 analysis

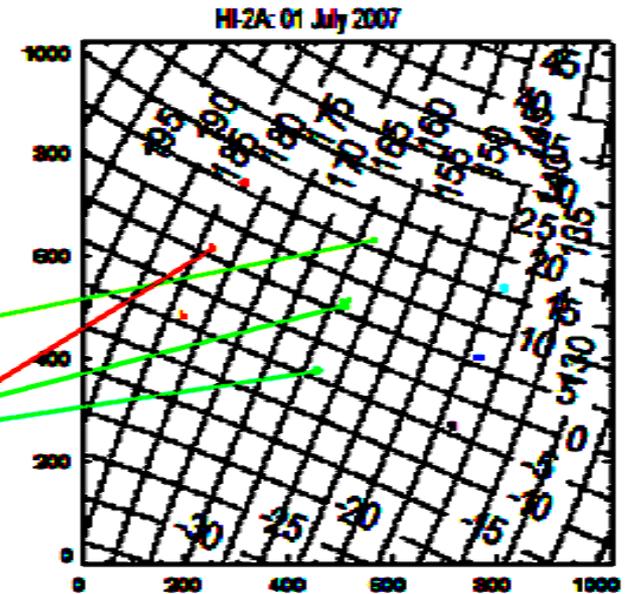
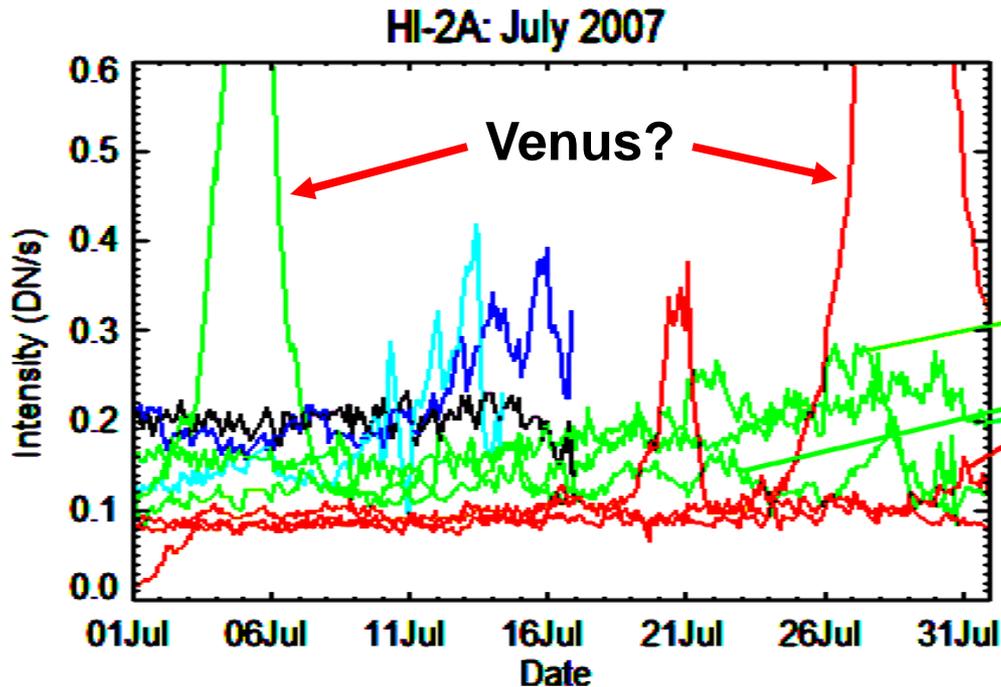


SMEI observations and comparison with STEREO

Sample HI-2A brightness time series for select sky sidereal locations

HI-2A brightness time series
with a long-term (7-day
minimum) base removed.

HI-2A image on 01 July
and time series locations



SMEI observations and comparison with STEREO

Summary and where are we going:

We have now devised a way to understand and analyze SMEI observations and to ascertain how well our reconstructions work.

Provided the HI-2 instrument stability to provide bright background (we think they are the tools required to view coronal holes) to reconstruct the region covered by the HI-2 and SMEI.

