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

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SMEI observations and comparison with STEREO

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

2003/05/30 00:00 UT

Excess Mass(g): 1.844E+016
Total Mass(g): 2.491E+016
Ambient (g): 6.470E+015
Energy (ergs): 3.448E+031
Volume: 0.144 AU^3

2003/05/30 00:00 UT

Excess Mass(g): 5.117E+015
Total Mass(g): 6.921E+015
Ambient (g): 1.804E+015
Energy (ergs): 8.759E+030
Volume: 0.030 AU^3
SMEI observations and comparison with STEREO


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.**

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

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

**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

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

**SMEI C.A.T. Analysis**

Ecliptic cut

Meridional cut
SMEI observations and comparison with STEREO

20 November 2007 CME higher-resolution analysis

Ecliptic cut

SMEI C.A.T. Analysis

Fisheye
SMEI observations and comparison with STEREO

20 November 2007 CME *in situ* analysis

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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
- 3D reconstruction of the STEREO A view
- STEREO A image with a combined image average subtracted
- SMEI C.A.T. Analysis

SMEI - STEREO A FOV

CASS/UCSD
SMEI observations and comparison with STEREO

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

STEREO A view
SMEI C.A.T. Analysis

STEREO B view
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

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SMEI observations and comparison with STEREO

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

2007/01/27 12:00 UT

Excess Mass = $2.12^{16}$ g
Total Mass = $2.80^{16}$ g
Ambient = $7.02^{15}$ g
Volume = 0.104 AU$^3$
SMEI observations and comparison with STEREO

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

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

Venus?
We have now devised a wealth of “tools” to understand and analyze the SMEI image data, and to ascertain how well the SMEI 3D reconstructions work.

Provided the HI-2 instruments have the stability to provide brightness above a long-term base (we think they do), we now have the tools required to view common structures and to reconstruct the regions in common between the HI-2 and SMEI.