Multi-spacecraft Comparison of ICME Flux Rope Signatures

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A Very Small Geomagnetic Storm Associated With an ICME/Cloud
Reconnection Exhausts Associated with an ICME/Cloud-Driven Disturbance

11 exhausts in a 1.5-day interval.

5 exhausts within the cloud and 1 at trailing edge.

3 of cloud exhausts occurred at local field shear angles < 18°!
19 Nov 2007
GSE Positions
19-22 Nov 2007
ACE

B
BGSE
Clock
V
N
T
Pdyn
IMF clock angle definition:
\[ \theta = \arctan\left(\frac{B_Y}{B_Z}\right) \]
\( \theta = 0 \) (northward BZ)
\( \theta = 90 \) (positive BY)
19-22 Nov 2007
STEREO-A

B
BGSE
Clock
V
N
T
Beta
Pdyn
ICMEs Observed by STEREO A/B

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</thead>
<tbody>
<tr>
<td>2</td>
<td>B</td>
<td>2007 142 5/22 04:20</td>
<td>2007 142 5/22 04:20</td>
<td>2007 142 5/22 22:00</td>
<td>135</td>
<td>17.5</td>
<td>480</td>
<td>-60</td>
<td>1</td>
<td>STEREO B: higher P_tmax, shorter. At both A &amp; B, followed by fast stream</td>
</tr>
<tr>
<td>3</td>
<td>A</td>
<td>2007 142 5/22 14:00</td>
<td>2007 142 5/22 14:00</td>
<td>2007 143 5/23 13:30</td>
<td>63</td>
<td>11.5</td>
<td>540</td>
<td>-80</td>
<td>2</td>
<td>not nice B rotations, slow, low β, followed by a SIR</td>
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<tr>
<td>5</td>
<td>B</td>
<td>2007 364 12/30 02:00</td>
<td>2007 364 12/30 07:00</td>
<td>2008 1 1/1</td>
<td>120</td>
<td>12</td>
<td>365</td>
<td>-85</td>
<td>1</td>
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( )*: values are from the region including the sheath region

ΔV^1: temporal variation of solar wind speed over one event

Group^2: We sort ICMEs into 3 groups depending on their temporal profiles of Pt. Corresponding to the Group 1, 2, and 3 ICMEs, the Pt profile, excluding any shock and/or sheath region (if present), respectively, has a central pressure maximum, a steady plateau, or a gradual decay. In the hypothesis that all ICMEs have a central flux rope, these three groups of Pt profiles are due to different approach distances to the central flux rope. Group 1 ICMEs are assumed to be the ones penetrated by spacecraft near the flux rope axis, and they usually present signatures of magnetic clouds. See Jian et al. [2006a] for more detail.

http://www-ssc.igpp.ucla.edu/~jlan/STEREO/Level3/STEREO_Level3_ICME.pdf
G-S Reconstruction of a Magnetic Cloud
Observed by Helios

MC Orientation=[ 0.28734  -0.87541  0.38872 ]
B-Field Map: 04–Jan–1978 08:00:00 – 05–Jan–1978 12:00:00

x axis= 0.95653  0.24112  -0.16407
y axis= 0.04990  0.41896  0.90663
Proposed Analysis

- Perform GS-like and MHD reconstructions of three flux rope events in 2007 for different STEREO intra-spacecraft separations.
- Compare magnetic field and plasma structure at different positions relative to flux rope. Emphasis on IMF clock angle.
19-22 Nov 2007
Multi-spacecraft comparison relative to ACE

ST-A - 16 hrs
ST-B + 3.5 hrs