

Descriptions of Figures 1-6 (the numbers are at the lower right corner of each figure):

**Figure 1.** Title page and orbit. The main points are:

- (1) 2 S/C conjunction at the dawn magnetopause.
- (2) North-south separation allows us to identify the reconnection site (because of opposite flows)

Figure 2 and 3 are similar. One shows the density, the other the magnetic field (for magnetopause identification). Please choose one of the two.

**Figure 2** (Option 1):

Panels top to bottom: EQ-S density, north-south velocity, Geotail north-south velocity, density, IMF clock angle.

- \* IMF purely southward:  $+180^\circ$  or  $-180^\circ$ .
- \* The LMN (boundary normal) coordinate system is shown at the bottom. L is like Zgsm.
- \* The magnetopause can be identified from the density variations.
- \* Blue (Red) shades indicate positive (negative) flow enhancements larger than 150 km/s.
- \* Equator-S flows: mostly northward
- \* Geotail flows: mostly southward
- \* These flows are encountered almost every time the S/C crossed the magnetopause -> continuous reconnection at the magnetopause. (Because of this, simultaneous crossings by the 2 S/C are not needed to conclude that the opposite flows are indeed simultaneous).
- \* There are actually simultaneous crossings at 13:33 UT where opposite flows are observed.
- \* "Exceptions" ( $VL < 0$  for EQ-S and  $VL > 0$  for Geotail) mean that the X-line has moves passed the S/C.

**Figure 3** (option B). Same as Fig. 2, but the magnetopause is identified by BL.

**Figure 4.** Test of jump condition across a rotational discontinuity, i.e., test for reconnection. For **Equator-S** events.

- \* The equation involves the tangential (L,M) components of the flow and field only.
- \* index 1 is a point in the magnetosheath right before the MP crossing.
- \* index 2 is taken at maximum flow acceleration. This point should correspond to the magnetospheric edge of the rotational discontinuity.
- \* the positive sign in the equation corresponds to the X-line being below the S/C

#### Findings:

- \* for the 2 events shown, the agreement between theoretical flow acceleration (obtained from the equation by inserting the magnetic field and density into the formula) and observed acceleration is excellent, in both the magnitude and the angle.

Statistics: for 8 complete crossings, the average agreement of the flow magnitude is 0.85, the average angle is 3.9 degrees (excellent!)

**Figure 5.** Test of jump condition across a rotational discontinuity, i.e., test for reconnection. For **Geotail** events.

\* the negative sign in the equation corresponds to the X-line being above the S/C

Findings:

\* For the 2 events shown, the agreement between theoretical flow acceleration (obtained from the equation by inserting the magnetic field and density into the formula) and observed acceleration is still excellent.

Statistics: for 4 complete crossings, the average agreement of the flow magnitude is 0.76, the average angle is 5.6 degrees (excellent!)

**Figure 6.** The big picture.

\* First simultaneous detection of oppositely directed reconnection jets at the dayside MP.

\* X-line stable (because of repeated encounters of reconnection flows)

\* X-line lies in equatorial plane (because the flow accelerations are predominantly north-south)

\* X-line at least 3 RE-long along east-west direction (because S/C separation is 3 RE)