

Magnetopause motion estimated from Geotail/EPIC data during SCs

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The Earth's Magnetopause (MP) is continually in motion due to both the solar wind and local instabilities. MP velocity has been estimated in three ways as described below:

- (1) Using time lag measurements by multiple spacecraft,
- (2) Using plasma velocity and magnetic field measurements from a single spacecraft, and
- (3) Remote sensing technique based on measurements of energetic ions.

In this study, we conjectured MP velocity using method of (3). In addition, we also used a method categorized in (2), Minimum Faraday Residue (MFR) analysis (Terasawa et al., 1996) for comparison. We investigated the relationship between MP velocity and the solar wind parameters derived from WIND or ACE spacecraft.

We used the data from Ion Composition System (ICS) sensor of the EPIC instrument on Geotail. In this study, we used the P2 channel (proton (58-77 keV), time resolution is 6 seconds). Using data set in the period of January, 1996 to March, 2002, we could identify 12 events when Geotail was near the MP during SC. We confirmed that these events were SCs with MID-LATITUDE GEOMAGNETIC INDICES ASY and SYM data book.

Observational results can be summarized as follows.

MP speed tended to be correlated with the magnitude of IMF, not correlated with the dynamic pressure.

Angle between the shock normal vector and the MP normal vector was larger as magnetic shear (angle of magnetic field between magnetosphere and magnetosheath) was large.

These results suggest that when magnetic shear is large, the MP is eroded by reconnection during SCs.

This remote sensing technique is also applicable to estimate plasma sheet motion during substorms.

We plan to report the method of remote sensing technique in detail and preliminary analyses of plasma sheet expansion.