

Statistical analysis of substorm-associated motion of the near-tail magnetopause

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Past studies in literature suggest that the near-earth magnetotail inflates during the growth phase of the substorm, then returns to its quiet-time shape after the expansion onset of the substorm. In this paper, we use the data of GEOTAIL and study, on a statistical basis, the motion of the near-tail magnetopause ($X=5$ to $X=-50$ Re) during substorms. Due to its orbital design, GEOTAIL often stays for a long time near the low-latitude magnetopause, longer than satellites used in past studies. Thus, the dynamic motion of the magnetopause may be monitored better by GEOTAIL, unaffected by the motion of the satellite itself.

Substorms are identified in the CANOPUS CL index and/or by means of low-latitude $Pi2$'s observed by the Circum-pan Pacific Magnetometer Network. Among them, we further select substorms when GEOTAIL was located at $X=5$ to -50 Re and less than 3 Re away from the nominal magnetopause location. Then we look for paired magnetopause crossings near the times of the substorms. So far we have looked at all data from September 1993

till the end of 1994. As a result, we have identified 52 substorms for which GEOTAIL kept staying in the magnetosheath, 9 events for which GEOTAIL mainly stayed in the magnetosheath but made a brief entry into the magnetotail, 34 events for which GEOTAIL mainly stayed in the magnetotail but made a brief exit to the magnetosheath, and 27 events for which GEOTAIL kept staying in the magnetotail. These numbers suggest that the low-latitude magnetotail tends to shrink (after the expansion onset), but does not inflate well (before the onset).