

## Statistical analysis of substorm-associated deformation of the magnetotail

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In order to study the motion of the tail magnetopause during substorms, we have (so far) analyzed 15 months' data (from 1993 to 1994) of GEOTAIL, and the results are as follows. GEOTAIL often observed that the tail shrank after the substorm expansion onset, and then recovered toward a quiet-time shape. The shrinkage may be the result of the rarefaction in the substorm onset region, caused by plasma flows streaming away from the substorm onset region. In addition, the shrinkage appears to have been more frequent in the duskside than in the dawnside. We also note that the inflation of the tail was observed less frequently than the shrinkage by GEOTAIL. This may be because GEOTAIL mainly resided in the low-latitude region.

Past studies have shown that the tail magnetosphere tends to inflate during the substorm growth phase and recover toward the quiet-time shape after the expansion onset. The purpose of this paper is to examine the magnetopause motion during the substorm by statistically analyzing GEOTAIL observations. The orbit of GEOTAIL is set so that it is often close and parallel to the average magnetopause shape in the wide X range, enabling us to monitor the motion of the magnetopause unaffected by the motion of the satellite itself. In addition, in contrast to the satellites used in the past studies, GEOTAIL mainly observes the low-latitude magnetopause, also because of its orbit design.

We have so far analyzed 15 months' data (from 1993 to 1994) of GEOTAIL, and the features found are as follows. GEOTAIL often observed a temporal exit from the magnetosphere to the magnetosheath after the substorm expansion onset, followed by its return to the magnetosphere. This may be the result of a rarefaction in the substorm onset region, caused by plasma flows streaming away from the substorm onset region. This does not necessarily contradict with the result of the past studies, but the inward motion of the tail magnetopause after the onset may need to be regarded as a dynamic tail shrinkage rather than a recovery of the inflated tail. We also note that the statistical analysis so far suggests that the inflation of the tail was observed less frequently than the shrinkage by GEOTAIL. This may be because GEOTAIL mainly resided in the low-latitude region.

The analysis also suggests that the substorm-associated shrinkage of the magnetotail was more frequent in the duskside than in the dawnside. We are looking at more events to statistically conclude this is the case.