

Substorm-associated magnetic field configuration in the near-Earth Tail

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It is well known that the magnetic field becomes more taillike in the substorm growth phase in the near-Earth magnetotail on the basis of observations near synchronous orbit. Geotail has provided magnetic field observations near 10 Re. There are some cases in which synchronous spacecraft and Geotail are aligned in the same meridian. It is found that the magnetic field is significantly taillike near 10 Re, even when the magnetic field is not so taillike at synchronous orbit.

It is well known that the magnetic field becomes more taillike in the substorm growth phase in the near-Earth magnetotail on the basis of observations near synchronous orbit. Geotail has provided magnetic field observations near 10 Re, and there are several fortuitous cases in which geosynchronous spacecraft and Geotail are almost aligned in the same magnetic meridian. At 0655 UT on July 22, 1998, a substorm started near Fort Smith (67.1 geomagnetic latitude, 22.3 MLT). The westward electrojet was located south of Gillam (65.8 geomagnetic latitude) near the midnight meridian. The central longitude of the current system was located near the midnight meridian, since the D deflection was positive at Boulder (23.4 MLT) and negative at Fredericksburg (1.6 MLT). Geotail (at 9.2 Re) and GOES 10 (at 6.6 Re) were aligned almost in the midnight meridian near 0700 UT, and they observed substorm onset signatures. At 6.6 Re, the observed magnetic field was comparable to the T96 model even just before the onset. At 9.2 Re, the magnetic field was only 12.7 nT just before the onset, and this value was much smaller than the T96 model value of 28.5 nT. Hence, the magnetic field is significantly taillike beyond synchronous altitude even for small substorms. For the substorm starting near 0730 UT on April 18, 1996, GOES 8, GOES 10, Wind, and Geotail were all in the magnetotail inside 14 Re. The westward electrojet was located south of Fort Simpson (67.3 geomagnetic latitude, 22 MLT). We have modified the T96 model with adding the strong tail current on the basis of 4-point magnetic field measurements. We have found that the magnetic field line starting at 66 geomagnetic latitude on the ground reaches beyond 20 Re in the magnetotail.