Erosion Effect of the Magnetopause Associated with the Geosynchronous Magnetopause Crossing Event on November 7, 2002.

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On November 7, 2002, the ACE satellite detected a clear Interplanetary Shock (IPS) associated with the Coronal Mass Ejection (CME), which started on Nov. 5 (as observed by the SOHO satellite) from the surface of the Sun and expand. The IMF Bz at ACE then turned negative with amplitude of ~25 nT in the interval from 1610UT to 1740UT. A clear Storm Sudden Commencement (SSCs) was observed widely on the ground with amplitude of 45 nT at OKI (Mlat=19.6 degree) at 1637UT, and a maim phase of a magnetic storm immediately started and continued until 2400UT. On the other hand, geosynchronous satellites GOES8 and GOES10 detected a southward magnetic field during the main phase of this storm; which indicates that the magnetopause strongly shrunk and two GOES satellites went out to the magnetosheath (Geosynchronous Magnetopause Crossing; GMC). In more detail, GOES8 first crossed the magnetopause at 1655UT, and then GOES10 crossed the magnetopause at 1720UT. The two GOES satellites were located outside of the magnetosphere for about 1.5 hour, then almost simultaneously went into the magnetosphere at ~1840 UT.

We have estimated the shock angle from the IMF data of the ACE satellite by using the coplanarity method and obtained Theta=-4.4 degree and Phi=-13.1 degree, where Theta and Phi are the latitude and longitude of the normal vector in the GSE coordinate system, which (Theta,Phi)=(0,0) meaning the positive X-axis direction. The Solar wind dynamic pressure (Pd) was about 8 nP during the CME passage.

Many investigators have studied the motion of the magnetopause (e.g. Shu et al, 1998, Petrinec and Russell, 1996, Chao et al, 2001, and Yang et al., 2002). In particular, the Chao model corrected the previous models by using data of many GMC events. This Chao model shows that the solar wind dynamic pressure of 8 nP is not enough to move the magnetopause inside of the geosynchronous orbit; for our GMC event, the strong southward IMF was the main factor which moved, via erosion, the magnetopause inside of the geosynchrnous orbit.

We will discuss this magneopause erosion in term of a large-scale magnetospheric convection associated with the GMC event.