Structure of magnetospheric flux transfer events and associated backward ion flow: Statistical study using 7 years of Geotail data

Takuma Nakamura[1]; Taiyo Yamazaki[2]; Hiroshi Hasegawa[3]; Tsugunobu Nagai[4]; Yukinaga Miyashita[3]; Iku Shinohara[5]; Masaki Fujimoto[6]; Toshifumi Mukai[7]
[1] ISAS,JAXA; [2] Dept. Earth & Planet Sci., Tokyo Institute of Technology; [3] ISAS/JAXA; [4] Tokyo Institue of Technology; [5] JAXA/ISAS; [6] ISAS, JAXA; [7] JAXA

We perform a statistical analysis of the low-latitude flux transfer events (FTEs) using Geotail MGF and LEP data combined with ACE SWEPAM and MFI solar wind data obtained from February 1998 to March 2005. In this study, we focus on FTEs observed earthward of the magnetopause, that is, magnetospheric FTEs. The principal signature of an FTE is a characteristic bipolar variation in the magnetic field component normal to the magnetopause (BN). We identified 385 isolated bipolar BN events around the dayside (X>0) magnetopause. Among the 385 events, 64 are identified as clear magnetospheric FTEs. First, we investigate the structure of the magnetospheric FTEs using the field and the plasma data. The magnetospheric FTEs are always observed with magnetosheath-like cold-dense plasmas. In addition, in these magnetosheath-like regions, a strong anti-subsolarward ion flow is always observed. These results are consistent with previous interpretation of magnetospheric FTEs that reconnected open field lines are transferred anti-subsolarward in the magnetosphere. We however found a new feature in nearly all events that after passing the magnetosheath-like regions, significant backward (namely subsolarward) ion flows are observed. It is noteworthy that most of these backward flows consist of magnetospheric plasma mixed with the magnetosheath plasma. To explain how such backward ion flows are produced, we propose a new 're-reconnection' model in which open field lines that form the FTEs are reconnected with closed magnetospheric field lines that come to contact with and are pushed by the FTEs. We will present detailed analyses of the magnetospheric FTEs and associated backward ion flows.