E040-006 Room: 101B Time: May 29 10:15-10:30

Energetic electrons transport of magnetospheric origin: from plasma sheet to magnetosheath

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The particle acceleration and transport of energetic electrons are the essential and fundamental problems in space. To reveal the origin of energetic particles, several past satellite observations contributed to understanding these problems. Both of the local structure such as magnetic reconnection and the global structure of the magnetotail which depend on the solar wind condition are important to understand the accelerating and transport mechanism of energetic electrons. A statistical and systematical study of the dawn-dusk plasma sheet and magnetosheath asymmetry is conducted by using both the thermal/middle energy electrons of less than 40keV (LEP) and the energetic electrons of greater than 38keV (EPIC) onboard the Geotail satellite. We find that the enhanced energetic electron flux exists dawn-side and the dawn-dusk plasma sheet asymmetry is clearly observed for the energetic electrons of greater than 38keV, while the asymmetry is not clearly found for the low energy electrons. The dawn-dusk magnetosheath asymmetry can be also detected for the energetic electrons of greater than 38keV, and the similar energy dependence can be found for the magnetosheath plasma adjacent to the magnetopause. By examining several magnetopause crossing events, it is found that the energetic electrons flux does not strongly change across the magnetopause, while the flux of the thermal/middle energy electrons dramatically drops in the magnetosheath side. These results suggest that the thermal plasma can be well confined to the magnetopause, while the energetic electrons preferentially leak out across the magnetopause. Concerning on the leakage mechanism, it is found that the leakage of energetic electrons is likely occurring when the local magnetosheath Bz greater than 0. Our study will give a new insight on the transport of energetic electrons from the plasma sheet into the magnetosheath.