Evolution of the Cold Dense Plasma Sheet during the Northward Interplanetary Magnetic Field Intervals

Masaki Nishino[1], Toshio Terasawa[2], Masahiro Hoshino[3]

[1] Earth and Planetary Sci., Univ. of Tokyo, [2] Dept. Earth Planetary Sci., Univ. of Tokyo, [3] Earth and Planetary Phys., Univ of Tokyo

We have performed an observational study on the evolution of the cold dense plasma sheet (CDPS) in the near-Earth magnetotail during the northward interplanetary magnetic field (IMF) intervals. We use the WIND and GEOTAIL data in this study.

In the recent studies it was pointed out that the plasma sheet becomes cold and dense under the northward IMF conditions (e.g. Terasawa et al., GRL, 1997). Terasawa et al. studied statistically that the response time of the plasma sheet to the solar wind is about 9 hours during the northward IMF intervals. This time scale is quite longer than that of plasma transport by magnetic reconnection during southward IMF intervals, and it is thought to be closely related to the transport mechanism of the cold dense ions in the near-Earth tail during the northwared IMF intervals. However, what determines this time scale has not been revealed yet.

In this paper, we first report that the CDPS in the duskside plasma sheet is formed within several hours after the northward turning of the IMF. This CDPS typically has two-temperature ion distribution function with higher-energy part (above 1 keV) and lower-energy part (below 1 keV) [Fujimoto et al., JGR, 1998]. Such two-temperature CDPS is often observed near the dusk tail-flank, but hardly observed in the dawnside.

Secondly we report the fate of the CDPS with two-temperature ion distributions. If the northward IMF condition continues after the CDPS is formed, one-component CDPS appears in several hours. This means that the high-energy component disappears about 10 hours after the northward turning of the IMF if its northward direction is kept. We note that the time scale of disappearance of the high-energy component is compatible with that of plasma sheet response time during the northward IMF intervals (9 hours) mentioned above.

In the presentation we will discuss global plasma replenishment in the plasma sheet during the northward IMF intervals.