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A 会場 ：9/25　PM2 （15:45-18:15）
17:30〜17:45

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Dependence of ion and electron properties in the central plasma sheet on the solar wind conditions: Long-term Geotail observations

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Observations have shown that conditions in the Earth's plasma sheet is largely changed by the solar wind conditions. There is good correlation, for example, between solar wind density and plasma sheet density. The cold and dense plasma sheet is formed under northward IMF (interplanetary magnetic field), while the hot and tenuous plasma sheet is formed under southward IMF [e.g., Terasawa et al., 1997]. From these facts, the major plasma source of the plasma sheet is considered to be the solar wind and the plasma supply mechanisms depend largely on the IMF orientation. One of the important parameters to give us a clue of the supply mechanisms is the temperature ratio between ions (T_i) and electrons (T_e). The solar wind plasma is heated as entering into the magnetosphere. The temperature ratio (T_i/T_e) in the magnetosheath is often higher than that in the plasma sheet. Wang et al. [2012] showed that there is dawn-dusk asymmetry of T_i/T_e in the plasma sheet. However, how ion and electron temperatures and their ratio change with the solar wind conditions is far from understood.

Utilizing long-term magnetotail observations by the Geotail spacecraft at tailward distances of 10-30 R_e during a period over a solar cycle from 1995 to 2006, we here investigate statistical properties of the central plasma sheet (CPS). We conducted statistical analyses with calibrated LEP-EA ion and electron data as well as the magnetic field data onboard Geotail. We selected CPS observations and derived temperature and density using the same method and criteria as Terasawa et al. [1997]. The results show that the plasma sheet density (temperature) has a good correlation with the solar wind density (kinetic energy) throughout the solar cycle. We find clear dawn-dusk asymmetry in T_i/T_e. The average T_i/T_e is higher on the duskside than on the dawnside only under northward-Bz-dominant IMF conditions. Observations also indicate that the dawn-dusk asymmetry of T_i/T_e is caused by high-density, low temperature, and high-T_i/T_e plasma entry from dusk, which has properties similar to the magnetosheath plasma. The IMF dependence of the T_i/T_e asymmetry cannot be explained by previously considered the magnetic drift effects [e.g., Wang et al., 2012]. Our statistical results suggest that the shocked solar wind plasma can easily enter the duskside plasma sheet rather than the dawnside during northwad IMF periods. A possible scenario to explain these observations is an asymmetric plasma entry by Kelvin-Helmholtz instability (KHI), since previous studies have suggested higher occurrence frequency of KHI in the duskside than dawnside [e.g., Bouhram et al., 2005; Taylor et al., 2012]. In the presentation, we will also report on empirical models of the central plasma sheet ion and electron temperatures as well as density based on the long-term observations.

References:
Terasawa, T., et al., Geophys. Res. Lett. (1997), 24, 935-938, doi:10.1029/96GL04018.
Wang, C.-P., et al., J. Geophys. Res. (2012), 117, A08215, doi:10.1029/2012JA017658.
Taylor, M. G. G. T., et al., Ann. Geophys. (2012), 30, 1025-1035, doi:10.5194/angeo-30-1025-2012.
Bouhram, M., et al., Ann. Geophys. (2005), 23, 1281-1294, 10.5194/angeo-23-1281-2005.