Dawn-dusk asymmetry in the cold-dense plasma sheet under northward IMF: THEMIS and Geotail observations

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The mechanism of solar wind entry into the Earth's magnetosphere and the processes of plasma heating, acceleration and transport following the entry are important problems in the magnetospheric physics. It has been known that the near-Earth plasma sheet becomes cold and dense under prolonged northward IMF [e.g., Terasawa et al., 1997], and the formation of the cold-dense plasma sheet (CDPS) is thought of as evidence of solar wind entry across the magnetopause [Terasawa et al., 1997: Fujimoto et al., 1998]. One of the known signatures of the CDPS is dawn-dusk asymmetry in ion energy spectra [Fujimoto et al. 1998, 2002]. The ion spectra on the duskside often exhibit two distinct components: one with a lower temperature indicative of the magnetosheath origin and the other with a higher temperature similar to that of the nominal plasma sheet. In contrast, the dawnside ion spectra consist of one component with a broad peak. This asymmetry indicates that heating/transport processes are different for the dawn and dusk flanks. However, there remains a problem whether these structures are formed in both flanks at the same time, because previous studies of the CDPS formation are mainly done by statistics or observations by a single spacecraft with a long time-lag to measure both flanks. Here, we will report an event in which THEMIS and Geotail observed the dawn-dusk asymmetry almost simultaneously under extended northward IMF for more than 5 hours. Geotail in the tail plasma sheet on the duskside observed two-component ions. At almost the same time, on the dawnside, the one-component cold-dense ions in the CDPS were observed by an outer spacecraft of THEMIS and hot-dense ions were observed by inner ones. This indicates that different heating/transport processes are at work simultaneously in the dawn and dusk flanks. In addition, we will show the time evolution of the plasma sheet structure on the dawnside, and discuss possible paths of the plasma transport triggered by an IMF southward turning.