

## Dawn-dusk asymmetry in ion temperatures in the near-Earth cold plasma sheet observed by Geotail spacecraft

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### 1. Introduction

It has been known that the near-Earth plasma sheet becomes cool and dense during the northward IMF intervals, which has been recognized to be evidence of plasma transport from the solar wind into the near-Earth magnetotail. Concerning this cold plasma sheet, there is a clear dawn-dusk asymmetry in the ion distribution function. While the cold plasma sheet on the dawnside has only one peak in the ion counts (that is called one-temperature plasma sheet), the ions in the dusk plasma sheet at times has two peaks and such plasma sheet is called two-temperature plasma sheet. Because the two components of ions are thought to have different origins, we need to deal with the two components separately to fully discuss their signatures as well as responses to the solar wind.

### 2. Data and method

We have surveyed 9 years' Geotail data to find typical cold plasma sheet events, and classified them into dusk, dawn, and midnight cases. We focus on the two-temperature ions in the dusk and midnight cold plasma sheet as well as the one-temperature cold plasma sheet in the three regions. In order to evaluate parameters of such two-temperature plasma sheet quantitatively, we have applied two-Maxwellian mixture fitting to the observed ion distribution functions [Ueno et al., 2001]. Since the original code is optimized for the three-dimensional data that exist during only limited periods for Geotail observations, we have further developed the code and applied it to the more abundant two-dimensional data that cover most of the intervals of Geotail's stay in the plasma sheet. In our analysis, the two-Maxwellian mixture fitting is applied to the one-temperature cold plasma sheet data as well.

### 3. Results of statistical studies

Comparing the estimated plasma sheet parameters with the solar wind data, we have found that both cold- and hot-component temperatures in each region are in good correlation with the solar wind speed. Normalizing the plasma sheet temperatures by the solar wind speed, we have found that the cold-component temperature on the duskside is lower than that on the dawnside, and that the hot component on the duskside is hotter than that on the dawnside. These statistical results show that there is a dawn-dusk asymmetry in the ion temperatures of both cold and hot components, which disagrees with a previous study by Wing et al. [2005]. In the case of one-temperature plasma sheet, the cold component on the dawnside is hotter than that on the duskside, which implies difference in the formation mechanism between the dawn and dusk cold plasma sheet. In addition, concerning the two-temperature plasma sheet on the duskside, the cold component near the magnetopause is cooler than that in the region distant from the magnetopause.

### 4. Summary

These results imply ion heating in the cold plasma sheet near the dusk magnetopause as well as in the dawn cold plasma sheet. We will discuss possible transport and heating mechanism of such cold ions in the near-Earth plasma sheet.