# IMF Bz dependent inner plasma sheet resulting from electric and magnetic drift transport

Chih-Ping Wang[1], and Larry R. Lyons[1], James M. Weygand[2], Tsugunobu Nagai[3], Richard W. McEntire[4]

[1]Department of Atmospheric and Oceanic Sciences, University of California, Los Angeles, California, USA

[2]Institute of Geophysics and Planetary Physics, University of California, Los Angeles, California, USA

[3]Department of Earth and Planetary Sciences, Tokyo Institute of Technology, Tokyo, Japan

[4]Applied Physics Laboratory, Johns Hopkins University, Laurel, Maryland, USA

## Abstract

Inner plasma sheet spatial structure is essential to substorm processes and strongly dependent of the IMF. To physically relate this structure to electric and magnetic drift transport, we have investigated statistically the equatorial distributions of ions and magnetic fields from Geotail when the IMF has been continuously northward or southward for shorter or longer than 1 hr, and have used these distributions to evaluate the electric and magnetic drift paths of ions versus energy. A dawn-dusk density (temperature) asymmetry with higher density (temperature) on the dawn (dusk) side is seen in the near-Earth plasma sheet during northward IMF, resulting in roughly dawn-dusk symmetric pressure. As southward IMF proceeds, the density asymmetry weakens while the temperature asymmetry maintains, resulting in higher pressure on the dusk side. The plasma sheet is relatively colder and denser near the flanks than around midnight. The flux distributions show that the density asymmetry is due to ions < ~3 keV and the temperature asymmetry is due to ions above thermal energy. The perpendicular flow shows that ions divert around the Earth mainly through the dusk side in the inner plasma sheet due to westward diamagnetic drift. The drift paths evaluated from the observations show that, for thermal energy ions, plasma transport by magnetic drift is as important as by electric drift in the inner plasma sheet. Comparison of the distributions of the observed phase space density with the evaluated drift paths at different energies indicates that the electric drift and energy dependent magnetic drift transport is responsible for the observed dawn-dusk asymmetries in the plasma sheet structure.