**Introduction/Motivation**

The terrestrial plasma sheet is a large volume of plasma which can globally alter it’s state in a short time period. The plasma sheet is also subject to localized fast flows within it’s volume. Because of the multi-scale nature of plasma sheet phenomena, previous plasma sheet studies have used two general methods: Individual Event Analyses & Long Baseline Time Averages

**Individual Event Analyses** focus on localized plasma sheet dynamics, at the expense of global plasma sheet properties (Baumjohann et al., 1990; Angelopoulos et al. 1992, 1994) and spatial scale gap that exists between these two methods.

**Long Baseline Time Averages** provide a global, statistical picture of the plasma sheet, averaging over dynamical fluctuations (Baumjohann et al. 1989; Angelopoulos et al. 1993; Huang and Frank, 1994; Wing and Newell, 1998; Kaufmann et al. 2002).

We would like to understand the connection between the localized high speed flows and the global convection pattern of the plasma sheet. We plan to use a global MHD model as a tool to bridge the time and spatial scale gap that exists between these two methods.

**But First**: We must validate the global MHD model with respect to the general features of the plasma sheet.

**Science Question**: Does the Lyon-Fedder-Mobarry global MHD model correctly describe the observed plasma sheet on large spatial scales and long time scales?

**Results**

- The plasma sheet is measured by Geotail
- The plasma sheet is simulated by LFM

**Discussion**

**Geotail Study**

Geotail data from the LEP [Mukai et al., 1994] and MGF [Kikubun et al., 1994] instruments were collected over a ~3.5 year period from 1996 to mid-1999. We select only those measurements with plasma parameters that are representative of the central plasma sheet (criteria at right). The $B_{XGSM}$ filter is the same as that used by Baumjohann et al. [1990].

**Plasma Sheet**

- $X_{GSM} < -10 R_E$
- $B_{XGSM} < 0.5$
- $T > 1 keV$
- $B_{ZGSM} < 15 nT OR B_{ZGSM} > 0.5$

**Lyon-Fedder-Mobarry MHD Study**

The Lyon-Fedder-Mobarry global MHD simulation solves the 3D time dependent ideal MHD equations in a cylindrical volume roughly stretching from $+30 R_E < X_{GSM} < 300 R_E$ with a $100 R_E$ radius. An example grid is shown below right (Lyon et al., 2004).

**Electric Field Comparisons**

Plotting the Geotail (left) and LFM (right) electric field magnitude $|E|$, we find a suggestive maximum near $X_{GSM} = -20 R_E$ and a similar feature further down the tail in the LFM model. This is a statistical manifestation of a near-earth neutral line.

**Velocity Fluctuation Comparisons**

The above plot compares the histograms of $V_{xGSM}$ for the 2 month interval of Geotail observations and simulation results for Geotail’s location during that time period. The LFM shows fewer tailward and very high-speed earthward flows.

**Summary**

- We have performed a statistical comparison of Geotail data with the LFM MHD model in the central plasma sheet.
- The statistical behavior of the model is largely consistent with the measurements, with the exception of the plasma flow speed and the flow direction primarily on the plasma sheet dusk side.

**Future Work**

- Perform Climatological comparison with the LFM coupled to the Rice Convection Model (RCM)
- Extend the LFM flow channel analysis of Wiltberger et al. (2000) to tie the localized dynamics of the model to the global convection pattern presented here.

**References**

- Baumjohann et al., 1989. Average plasma properties in the central plasma sheet. JGR, 94, 6597-6606.
- Baumjohann et al., 1990. Characteristics of high-speed ion flows in the plasma sheet. JGR, 95, 3801-3809.