NUMERICAL METHODS USED IN THE LYON-FEDDER-MOBARRY GLOBAL MHD CODE TO¡BR¿MODEL THE MAGNETOSPHERE

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The Lyon-Fedder-Mobarry (LFM) global MHD code is one of the leading codes used to simulate the coupled solar wind - magnetosphere - ionosphere system. This talk concentrates on the numerical techniques used to solve the MHD equations and how this solution is coupled to the ionospheric simulation.

The code uses the Partial Interface Method (PIM) to solve the MHD equations. fluxes through the cell interfaces and electric fields along the cell edges, to maintain magnetic field which remains divergence free. We present the results from one and two dimensional test problems that illustrate the robustness and strength of this technique.

The LFM uses a specially designed grid to model the magnetospheric and solar wind plasma. The distorted spherical grid was created to place maximal resolution in regions known a priori to be important, eg bow shock, magnetopause, magnetotail, and ionosphere. However the grid remains logically rectangular so that determination of nearest neighbors and the application of an finite volume method is relatively straight forward to implement.

The inner boundary condition on the magnetospheric plasma is determined from the ionospheric simulation. The plasma parameters are used with an empirical model to determine the anisotropic conductivity tensor. Once this tensor is known the application of current conservation between the field aligned currents (FAC) at the magnetospheric boundary and the ionosphere leads to a electrostatic potential equation that is solved by with an ICCG method.

This talk concludes with two examples of results computed using the LFM. High resolution simulations of the substorm dyanmics where studied using the observations of an isolated subtorm that occured on December 10, 1996. The statistical properties of plasma sheet determined by LFM are compared with a superposed epoch analysis of Geotail data.

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2. H - Waves in Plasma

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4. I - Invited Paper, Program chair: Huba

5. No special instructions