Geophysical Research Abstracts
Vol. 17, EGU2015-7589, 2015
EGU General Assembly 2015

Multiscale Particle-In-Cell Simulations of the Dayside Magnetopause

Jean Berchem (1), Giovanni Lapenta (2), and Maha Ashour-Abdalla (1)

(1) Department of Physics and Astronomy, UCLA, Los Angeles, California, United States, (2) Centre for Plasma Astrophysics, Department of Mathematics, Katholieke Universiteit, Leuven, Belgium

Understanding the transfer of energy and mass at the magnetopause requires following both the evolution of the large-scale interaction of the solar wind with the magnetosphere, and the details of the kinetic processes that enable that transport in localized regions of the magnetospheric boundary. To approach this multiscale problem, we have carried out $2\frac{1}{2}$ dimensional particle-in-cell (PIC) simulations of the dayside magnetopause. The computational domains of these PIC simulations are large enough to include large-scale features of the solar wind interaction with the geomagnetic field (e.g., curvature and plasma asymmetries) while also resolving local kinetic processes. The computing challenge is addressed by using the results of global magnetohydrodynamic (MHD) simulations to provide initial and boundary conditions for a two-dimensional version of the implicit iPic3d simulation code. We discuss the PIC simulation results in the context of the initial steady MHD state and spacecraft observations to highlight the effects of kinetic processes. In particular, we analyze the wave activity and follow the evolution of particle distributions in different regions of the simulations to assess plasma transport at the magnetospheric boundary.