Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Coupling the BATS-R-US global MHD code with the implicit particle-in-cell code iPIC3D L.K.S. DALDORFF, G TOTH, I. SOLOLOV, T. GOMBOSI, University of Michigan, J. AMAYA, G. LAPENTA, KU Leuven, J. BRACKBILL, Los Alamos, S. MARKIDIS, KTH, V. OLSHEVSKY, KU Leuven
— Magnetohydrodynamic (MHD) codes achieved considerable success in modeling space physics systems, such as the solar corona or the magnetosphere. Unfortunately, fluid models cannot describe the magnetic reconnection physics accurately, which plays an important role in determining the dynamics of the whole system. Particle-in-cell (PIC) codes can model the reconnection process accurately, but they are much more expensive than fluid models. Coupling the global fluid code with a regional PIC code can provide a physically accurate yet economic global model. Implicit PIC codes are especially suitable to be coupled with fluid codes, as they can employ much larger time steps and grid spacing than explicit PIC codes, and allow the fluid and PIC discretizations to employ comparable spatial and temporal resolutions. Adaptive mesh refinement in the fluid code can also facilitate bridging the scales between the two codes. We describe our initial progress towards coupling the adaptive mesh based BATS-R-US MHD code and the implicit PIC code iPIC3D.

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Date submitted: 12 Jul 2013 Electronic form version 1.4