Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Three-Dimensional Hybrid Simulations of Magnetized Plasma Plumes Y.A OMELCHENKO, H. KARIMABADI, SciberQuest,Inc, M. BROWN, Swarthmore College — Recent advances in computer technology and numerical algorithms have made it possible to model strongly kinetic large-scale plasmas with hybrid and particle-in-cell codes. The critical issue in these (global) simulations is efficient computational handing of disparate temporal scales which naturally arise in various regions of a large simulation domain. Quasi-neutral hybrid simulations are capable of modeling both macroscopic (confinement, stability, translation) and microscopic (turbulence, reconnection and ion energization) properties of finite-beta plasmas. In conventional hybrid simulations of strongly inhomogeneous systems, however, the global timestep has to be often severely reduced in order to properly account for energetic/fast gyrating particles and generation of local high-frequency oscillations. In contrast, our code HYPERS does not step spatially distributed variables synchronously in time but instead performs time integration by executing discrete events: asynchronous updates of particles and fields carried out as frequently as dictated by local physical time scales. Using this code we perform first-ever 3D hybrid simulations of plasma plumes in SSX with a focus on comparison of simulation results with experimental findings on ion energization and thermalization, turbulence and reconnection.

Y.A Omelchenko
SciberQuest,Inc

Date submitted: 24 Jun 2013 Electronic form version 1.4