Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Comparison of Implicit Multiscale Full Kinetics to Gyrokinetics
SCOTT PARKER, BENJAMIN STURDEVANT, YANG CHEN, University of Colorado — Recent progress has been made developing full kinetic Lorentz force ion dynamics using implicit multiscale techniques [1]. It is now possible to capture low-frequency physics along with finite Larmor radius (FLR) effects with a fully kinetic multiscale delta-f particle simulation. The utility of such a model is to be able to verify gyrokinetics in situations where the smallness of the ordering parameters are under question. Additionally, such a model can help identify what higher order terms in gyrokinetics might be important. Orbit averaging and sub-cycling are utilized with an implicit particle time advance based on variational principles. This produces stable and accurate ion trajectories on long time scales. Excellent agreement with the gyrokinetic dispersion relation is obtained including full FLR effects. Ion Bernstein waves are easily suppressed with the implicit time advance. We have developed a global toroidal electrostatic adiabatic electron Lorentz ion code. We will report our linear results benchmarking Lorentz ions with gyrokinetics for the Cyclone base case. We will also present our progress on ion including drift-kinetic electrons and electromagnetic perturbations. [1] B.J. Sturdevant, S.E. Parker, Y. Chen, and B. Hause, J. Comput. Phys., 316 519 (2016).

Scott Parker
University of Colorado

Date submitted: 13 Jul 2016 Electronic form version 1.4