Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

A Simulation Model for the Toroidal Ion Temperature Gradient Instability with Fully Kinetic Ions BENJAMIN STURDEVANT, SCOTT PARKER, YANG CHEN, University of Colorado Boulder — A simulation model for the toroidal ITG mode in which the ions follow the primitive Lorentz force equations of motion is presented. Such a model can provide an important validation tool or replacement for gyrokinetic ion models in applications where higher order terms may be important. A number of multiple-scale simulation techniques are employed in this work, based on the previous success in slab geometry with an implicit orbit averaged and sub-cycled δf model [1]. For the toroidal geometry model, we have derived a particle integration scheme based on variational principles, which is demonstrated to produce stable and accurate ion trajectories on long time scales. Orbit averaging and sub-cycling will be implemented with the variational integration scheme. The inclusion of equilibrium gradients in the fully kinetic δf formulation is achieved through the use of a guiding center coordinate transformation of the weight equation. Simulation results for the fully kinetic ion model will be presented for the cyclone base case and comparisons will be made with gyrokinetic ion models. [1] B. Sturdevant, S. Parker, Y. Chen, and B. Hause, J. Comput. Phys., 316 (2016) 519.

Benjamin Sturdevant
University of Colorado Boulder

Date submitted: 15 Jul 2016 Electronic form version 1.4