Abstract Submitted
for the DPP08 Meeting of
The American Physical Society

Self-consistent particle transport in a gyrokinetic Z-pinch with pitch-angle scattering[1] KYLE GUSTAFSON, WILLIAM DORLAND, University of Maryland, DIEGO DEL-CASTILLO-NEGRETE, Oak Ridge National Laboratory, INGMAR BROEMSTRUP, MICHAEL BARNES, University of Maryland
— We have developed a new nonlinear gyrokinetic δf PIC code with a proper pitch-angle scattering collision operator. For the present work, this code is useful for self-consistent particle tracking studies aimed at determining whether non-diffusive transport is relevant in gyrokinetic turbulence. A subset for each value of $k_\perp \rho_i$ is selected at random from the entire set of particles that determine the fields. While this technique is more involved than simply calculating flux, it is necessary for discovering evidence of non-diffusive transport. Non-diffusive transport is a consequence of non-Gaussian random walks. Observable results include power-law scaling of the variance of particle displacements and non-Gaussian displacement distribution functions. Here, we examine the nature of particle transport in our δf PIC code for multiple values of $k_\perp \rho_i$, with and without pitch-angle scattering, in an electrostatic Z-pinch geometry with a temperature gradient. This geometry includes tokamak-relevant curvature effects, but allows for less expensive two-dimensional simulations. Results are compared to analytic expectations and other observations of non-diffusive transport in tracer simulations.

[1]K. Gustafson is supported by the Fannie and John Hertz Foundation.

Kyle Gustafson
University of Maryland

Date submitted: 18 Jul 2008 Electronic form version 1.4