Gyrokinetic Simulation of Microinstabilities in Generalized Toroidal Geometry

W.X. Wang[1], Z. Lin[2], S. Ethier[1], J.L.V. Lewandowski[1],
T.S. Hahm[1], W.W. Lee[1], G. Rewoldt[1], J. Manickam[1], W.M. Tang[1]

[1] *Princeton Plasma Physics Laboratory, P.O. Box 451*
Princeton, NJ 08543
[2] *University of California, Irvine, CA*

Abstract

An existing global gyrokinetic particle code (GTC) uses an advanced field-line-aligned mesh, a real space Possion solver and magnetic flux coordinates for the particle push. In order to address the plasma turbulence properties of realistic tokamak experiments, a general geometry capability is developed for GTC. It directly reads experimental plasma profiles and uses the corresponding numerical equilibrium. We make use of symmetry coordinates, which facilitate visualization and construction of a relatively regular mesh in real space for strongly shaped plasmas. Gyrokinetic transformation of potential and charge density between particle and guiding center positions in general geometry is carefully treated, taking into account finite B_θ/B. Trapped electron dynamics is included via higher order corrections to the adiabatic electron response. Cross benchmarks with the eigenvalue code, FULL, are carried out. Applications of the simulations of ion temperature gradient modes with trapped electron dynamics to conventional tokamaks, such as DIIID and JET, will be reported.

Work supported by U.S. DOE.