Abstract Submitted
for the APR12 Meeting of
The American Physical Society

Gyrokinetic Particle Simulation of Alfven Eigenmodes with Zonal Fields[1] ZHIXUAN WANG, University of California, Irvine — Effects of collective Shear Alfven wave instabilities on the energetic particle confinement in tokamak depend ultimately on the nonlinear evolution of the turbulence with spontaneously generated zonal fields (zonal flows and zonal currents). In this work, we study nonlinear interaction of Alfvén eigenmodes with zonal fields using global gyrokinetic toroidal code GTC. We choose to start from the simplest case, linear electrostatic eigenmodes in cylindrical geometry, and then gradually extend our study into electromagnetic eigenmode in toroidal geometry. We have verified GTC for linear simulation in cylindrical geometry with the $E \times B$ flow shear. Ion temperature gradient instability is observed to be suppressed when ExB flow shear is strong enough. A good agreement has also been achieved between our simulation result of kinetic Alfvén wave and LAPD experimental result. Now we are doing TAE (torodicity-induced Alfvén eigenmodes) simulation using the DIII-D equilibrium data. Linear simulation result agrees well with DIII-D data. Our next step is to include nonlinear effects to study the interaction between zonal fields and TAEs. Work supported by DOE SciDAC GSEP Center and Plasma Science Center.

[1]Work supported by DOE SciDAC GSEP Center and Plasma Science Center.

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Date submitted: 06 Jan 2012 Electronic form version 1.4