Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Global gyrokinetic simulation study of micro-turbulence in the presence of magnetic islands[1] MIN-GU YOO, WEIXING WANG, EDWARD STARTSEV, CHENHAO MA, STEPHANE ETHIER, Princeton Plasma Physics Laboratory — It is essential to take into account the effects of magnetic islands on micro-turbulence to understand the physics associated with magnetic perturbations in tokamak plasmas, such as RMP and thermal quench. The nonlinear dynamics of electrostatic turbulence under the magnetic perturbations is simulated with global gyrokinetic GTS code by systematically considering additional particle transports and forces along the perturbed magnetic fields. We applied a magnetic perturbation of (m,n)=(3,2) mode on the cyclone base equilibrium to investigate how the magnetic island influences the temporal evolution of the micro-turbulence. At the very initial stage, the fast electron streaming rapidly flattens the electron temperature inside the magnetic island. As the ITG turbulence grows, the ExB transport correlated with the magnetic island plays an essential role in the nonlinearly saturated phase. We observe that the magnetic island size determines plasma transport behavior around the island. While a small island shows a weak influence on the plasma transport and ITG turbulence, a large island can generate strong ExB shear flows around its separatrix that can effectively mitigate or even suppress the ITG turbulence in the island region.

[1]Work supported by DOE SciDAC TDS project.

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Date submitted: 09 Jul 2019 Electronic form version 1.4