Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

The interaction of electrostatic turbulence and magnetic islands[1]

C.C. HEGNA, University of Wisconsin — A model describing the multiscale interaction of short wavelength electrostatic fluctuations with a long wavelength nonlinear magnetic island is developed. The magnetic island modifies the magnetic geometry and produces a helically modulated local shear that can modify the stability properties of the electrostatic fluctuations. Additionally, sheared flows associated with the magnetic islands can modify the turbulence. These effects combine to modulate the amplitude of the turbulence in the vicinity of the island as a function of helical angle. This can ultimately produce spatially dependent turbulent diffusion and viscosity coefficients. The turbulence affects magnetic island dynamics principally through a mean field- like force in the momentum equation (Reynolds stress) that is self-consistently modified by the helical nature of the island potential and profiles. This force subsequently affects island dynamics through a perturbed perpendicular current that enters into the island quasineutrality equation; in general, both island growth and rotation are altered. Implications for islands in 3-D equilibria and neoclassical tearing mode dynamics will be addressed.

[1]Research supported by U. S. DoE under grant no. DE-FG02-86ER53218.

C. C. Hegna
University of Wisconsin

Date submitted: 21 Jul 2006 Electronic form version 1.4