Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Electromagnetic effects on the energy flows saturating microturbulence GARTH WHELAN, MORITZ PUESCHEL, PAUL TERRY, Univerity of Wisconsin, Madison — In kinetic plasma turbulence mode coupling in perpendicular wavenumber excites large-scale stable modes, allowing both the perpendicular cascade and stable-mode damping to saturate the instability. Using GENE, we evaluate the dominant triad energy transfer function via zonal flows, distinguishing between energy transfer to stable modes and transfer to higher wavenumber. We find that in cyclone base case ITG turbulence, the zonal flows are excited primarily by modes with poloidal wavenumber equal to or below the wavenumber responsible for the peak in transport, while modes with larger poloidal wavenumber produce a smaller nonlinear energy transfer out of zonal flows. We investigate the dissipation that balances the net excitation by varying collisionality and the rate of geodesic acoustic mode damping. Increasing the temperature gradient sharpens the nonlinear zonal flow drive peak around the peak in transport. As plasma beta is increased, proportionally more energy is transferred to stable modes within the wavenumber region of instability, providing an effect responsible for the increased nonlinear stabilization of ITG turbulence with plasma beta. We also investigate Kelvin-Helmholtz like saturation mechanisms of ETG turbulence.

Garth Whelan
Univerity of Wisconsin, Madison

Date submitted: 23 Jul 2015 Electronic form version 1.4