Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Energy Transfers Saturating ITG Microturbulence[1] GARTH WHELAN, MJ PEUSCHEL, PAUL TERRY, UW-Madison — In plasma microturbulence, stable modes occur at the same wavenumbers as unstable modes, creating a dissipation range that overlaps with the driving range. We track nonlinear energy transfer in gyrokinetics through linked sequences of energy-conserving wavenumber triplets, seperating stable and unstable modes. For ITG turbulence, most of the transferred energy involves zonal flows. Low-wavenumber interactions transfer energy into the flows while higher-wavenumber ones transfer energy out. Increasing plasma beta increases energy transfer to damped modes, consistent with the nonlinearly enhanced beta stabilization of ITG turbulence. Furthermore, we focus on the Dimits regime, of importance in predicting turbulent onset in fusion devices. Here, energy transfer differs from the fully turbulent case in the balance between nonlinear energy transfer into and out of the zonal flows. At the linear ITG threshold, transfer into the flow is mostly dissipated linearly, while nonlinear energy transfer out increases with temperature gradient until the nonlinear critical threshold is reached. In contrast, above the nonlinear critical gradient, nonlinear energy transfer in to and out of the flows are approximately in balance, independent of the temperature gradient drive.

[1]supported by US DOE

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Date submitted: 07 Jul 2016 Electronic form version 1.4