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Energy Dissipation in 3D ETG-Driven Fluid Turbulence
JUHYUNG KIM, PAUL W. TERRY, Department of Physics, University of Wisconsin at Madison — Recent efforts to characterize the saturation of micro-turbulence indicate that there is significant dissipation by nonlinearly excited damped eigenmodes. In a 2D ETG fluid model, damped modes co-existing at low k_y with unstable modes dissipate energy during and after the transition to the nonlinear state through a strong nonlinear correlation between potential and pressure.[1] In this work, energy dissipation is numerically investigated in a 3D ETG fluid model in flux-tube geometry. While dissipation by damped modes is expected to be significant, the relative contributions by damped modes to various types of dissipation, including cross correlations and collisions, are not clear in the presence of Landau damping. The characteristics of energy dissipation in the transition to nonlinear state and the nonlinear steady state will be presented with the detailed analysis of energy transfer channels resolved in wavenumber space to distinguish high wave number dissipation, energy dissipation by damped modes and Landau damping.

[1]J.-H. Kim and P. W. Terry. Submitted to Phys. Plasmas, 2010.

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