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Saturation Analysis of Four Dimensional Kinetic Slab Ion Temperature Gradient Driven Turbulence DAVID HATCH, VASIL BRATANOV, FRANK JENKO, Max Planck Institute for Plasma Physics — Standard hydrodynamic turbulence paradigms define a saturation scenario wherein energy is transferred through a broad range of inertial scales via a conservative cascade and dissipated at small scales. In contrast, recent gyrokinetic studies have shown that in plasma microturbulence the energy injection scales and dissipation scales largely overlap. This phenomenon is linked to the excitation of damped eigenmodes at the same scales as the driving instabilities. We examine a reduced (retaining only parallel velocity dynamics) kinetic model for ion-temperature-gradient (ITG) driven turbulence in slab geometry in order to further elucidate these fundamental properties of plasma microturbulence. This simple model is studied numerically with a fully spectral (Fourier in space, and Hermite in the parallel velocity dimension) code in order to facilitate a detailed examination of energy transfer in a turbulent kinetic system. Connections are made between the nonlinear turbulence and the underlying linear eigenmode spectrum, which consists of an ITG mode, a stable ion sound wave, and damped Landau modes. In addition to the fundamental interest of this study, these results are expected to provide insights into possible techniques for more efficient modeling of kinetic turbulence.

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