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Energization by Landau Damping in Two- and Three-Dimensional Plasma Turbulence TAK CHU LI, GREGORY HOWES, University of Iowa, KRISTOPHER KLEIN, University of New Hampshire, JASON TENBARGE, University of Maryland — Plasma turbulence is ubiquitous in space and astrophysics. It plays an important role in particle energization. The processes that determine energy dissipation in turbulence remain highly controversial. This paper attempts to understand the fundamental physics of turbulent dissipation by considering low-beta (ratio of plasma to magnetic pressure) proton-electron plasma in gyrokinetic simulations with a significant mean magnetic field. We find that nonlinear gyrokinetic simulations in both two and three dimensions (2D and 3D) show a velocity space signature qualitatively similar to that of linear Landau damping of waves in a 3D linear simulation. This provides strong evidence that the turbulence energy is transferred to the particles by linear Landau damping, which eventually enables dissipation. We also show that energy in the 2D and 3D systems evolve in qualitatively similar but quantitatively different ways. The reasons why the limitation to 2D quantitatively changes the evolution of energy, but it does not eliminate Landau damping are elucidated. Applications to space plasma systems are discussed.

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