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Absolute equilibria of gyrokinetic fluctuations[1] JIAN-ZHOU ZHU[2], University of Maryland, GREGORY HAMMETT, Princeton Plasma Physics Laboratory — A paradigm based on the absolute equilibria of Fourier-truncated inviscid systems [R. H. Kraichnan and D. Montgomery, Rep. Prog. Phys. 43, 547 (1980)] to understand turbulence is applied to study gyrokinetic plasma turbulence. This approach has been successful in understanding fundamental issues of fluid turbulence, and provides useful benchmarks for analytical theories and numerical simulations. The existence of 2 conserved quantities (energy and enstrophy) in 2-D fluids gives rise to interesting features in the equilibrium spectrum, related to the existence of inverse cascade. We have derived the class of absolute equilibria for gyrokinetic fluctuations in 2 spatial dimensions and 1 (perpendicular) velocity dimension, including finite Larmor effects with the full Bessel functions in this framework. A range of spectra types are calculated with different parameters. Extensions to absolute equilibria in fully 5-D gyrokinetics are being explored. The implication of these results for ITG and ETG plasma turbulence will also be discussed.

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