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Treatment of MHD turbulence with non-equipartition and anisotropy YE ZHOU, LLNL, Univ. of California, W.H. MATTHAEUS, University of Delaware — Magnetohydrodynamics (MHD) turbulence theory, often employed satisfactorily in astrophysical applications, has often focused on parameter ranges that imply nearly equal values of kinetic and magnetic energies and length scales. However, MHD flow may have disparity magnetic Prandtl number, dissimilar kinetic and magnetic Reynolds number, different kinetic and magnetic outer length scales, and strong anisotropy. Here we discuss a phenomenology for such "non-equipartitioned" MHD flow. We suggest two conditions for a MHD flow to transition to strong turbulent flow, extensions of (i) Taylor's constant flux in an inertial range, and (ii) Kolmogorov's scale separation between the large and small scale boundaries of an inertial range. For this analysis, the detailed information on turbulence structure is not needed. These two conditions for MHD transition are expected to provide consistent predictions and should be applicable to anisotropic MHD flows, after the length scales are replaced by their corresponding perpendicular components. Second, we point out that the dynamics and anisotropy of MHD fluctuations is controlled by the relative strength between the straining effects between eddies of similar size and the sweeping action by the large-eddies, or propagation effect of the large-scale magnetic fields, on the small scales, and analysis of this balance in principle also requires consideration of non-equipartition effects.

Ye Zhou
LLNL, Univ. of California

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