Abstract Submitted
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Nonlinear Interaction between Magnetic Field and Stable Eigenmodes in Forced Shear-Flow-Driven MHD Turbulence[1] B. TRIPATHI, P.W. TERRY, University of Wisconsin-Madison, A.E. FRASER, University of Wisconsin-Madison; University of California, Santa Cruz, M.J. PUESCHEL, University of Texas at Austin, E.G. ZWEIBEL, University of Wisconsin-Madison — Transport and mixing in turbulent magnetized plasmas driven by unstable shear flows is a challenging nonlinear problem. Linearly stable (damped) eigenmodes, which are often neglected, can be crucial in saturating the instability. In gyrokinetic simulations of turbulence arising from a driven unstable shear flow, unstable and stable modes reach near-equipartition [Fraser et al. PoP (2018)]. When the flow is not driven and there is a flow-aligned magnetic field, faster relaxation in stronger fields can quasi-linearly flatten the profile before stable modes have time to affect the evolution. Here, we investigate turbulent saturation in MHD simulations of Kelvin-Helmholtz-unstable flows that are forced to prevent flattening of the mean flow, employing the Dedalus code with a flow-aligned magnetic field. We demonstrate that the stable modes break the hegemony of unstable modes in the nonlinear regime. The role of the magnetic field in determining the amplitudes of stable and unstable modes is quantified. With the nonlinear interaction among the magnetic field and different linear eigenmodes in hand, we pursue reduced models of Reynolds stresses, Maxwell stresses, and the ensuing transport phenomena by including the stable modes at saturation.

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Bindesh Tripathi
University of Wisconsin - Madison

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