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Potential Vorticity Homogenization and the Transition From Hydrodynamic to MHD Turbulent in 2D L.T. KATT, P.H. DIAMOND, University of California, San Diego, CASS 0424, La Jolla, CA 92093-0424 USA, S.M. TOBIAS, D.W. HUGHES, University of Leeds, Dept. Applied Maths, Leeds, U.K. LS2 9JT — Potential vorticity (PV) homogenization is a useful concept in understanding the overall trends in 2D hydrodynamic mixing and turbulence. It provides a natural way to understand the forward cascade of enstrophy in 2D hydro *without* invoking the apparatus of statistical turbulence theory. Also, it is well known that the inverse cascade of energy in 2D hydro is a consequence of the dual conservation laws of that system, along with the fact that PV is mixed. Here, we investigate the effects of a weak magnetic field on PV homogenization, with the aim of determining the strength of the field required to convert the direction of energy transfer from inverse to forward. Analytical calculations suggest a Hartmann number criterion for this alteration of the dynamics. Numerical calculations are consistent with the analysis, but suggest that some transfer of energy to small scales begins during the nearly kinematic stage of flux expulsion. Sensitivity of the results to vortex asymmetry and alignment of streamlines and field lines will be discussed.

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