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Stretching, mixing, and tearing: Magnetic self-organization in high-resolution simulations of the turbulent dynamo in Pm $>$ 1 plasma[1]
ALISA GALISHNIKOVA, MATTHEW KUNZ, Princeton University, ALEXANDER SCHEKOCHIHIN, University of Oxford — Turbulence in a conducting plasma can amplify seed magnetic fields in what is known as the small-scale, or turbulent, dynamo. The associated growth rate and emergent magnetic-field geometry depends sensitively on the material properties of the plasma, in particular the magnetic Prandtl number Pm. For Pm $>$ 1, the amplified magnetic field is gradually arranged into a folded structure, with direction reversals at the resistive scale and field lines curved at the larger scale of the flow. As the magnetic energy grows to come into approximate equipartition with the fluid motions, this folded structure persists. Using analytical theory and high-resolution MHD simulations with the Athena++ code, we investigate the conditions under which these magnetic folds may become unstable to tearing instability, and ask how the resulting disrupted current sheets affect the energy spectrum, geometry, and statistics of the magnetic field in its saturated state.

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