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Reconnection in Weakly Stochastic Magnetic Fields: Numerical Studies in 2D

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Abstract:
We study two dimensional turbulent magnetic reconnection in a compressible fluid in the gas pressure dominated limit. We use open boundary conditions and start from a Harris current sheet configuration with a uniform total pressure. A small perturbation to the vector potential initiates laminar reconnection at the Sweet-Parker rate, which is allowed to evolve for several dynamical times. Subsequently sub-Alfvenic turbulence is produced through random forcing at small wave numbers. The magnetic field topology near the current sheet is strongly affected by the turbulence. However, we find that the resulting reconnection speed depends on the resistivity. In contrast to previous results in three dimensions, we find no evidence for fast reconnection. The reconnection speed exhibits large variations but the time averages increase smoothly with the strength of the turbulence.