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Global simulations of dynamo and turbulent magnetic helicity transport in flowing plasmas F. EBRAHIMI, A. BHATTACHARJEE, Department of Astrophysical Sciences, Princeton University — We numerically examine the dynamo effect and turbulent helicity transport for magnetically and flow-driven turbulence. Using direct numerical computations, we calculate the fluctuation-induced dynamo effect, which is shown to have the functional form of a total divergence of a vector field, representing magnetic helicity flux produced by the fluctuations. We calculate the complete form of this flux, and compare it with other approximate fluxes (such as the so-called Vishniac-Cho flux) used in recent astrophysical dynamo studies. We find that for both magnetically driven reconnecting instabilities and flow driven magnetorotational cases, the functional form of this flux is determined by the free-energy source of the instability. If the instabilities are tearing modes (as is often the case for reversed-field pinches), the dynamo effect takes the form of hyper-resistivity which does not amplify flux. However, for the magneto-rotational instability, the form of this dynamo field is qualitatively different, and is shown to generate and support a large-scale toroidal magnetic field. Work supported by DE-FG02-12ER55142.

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