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The role of magnetic helicity flux on the alpha dynamo effect FATIMA EBRAHIMI, A. BHATTACHARJEE, H. JI, Princeton University — Self-organized plasmas are common throughout the universe. Examples include self-organized plasmas of flow-dominated astrophysical disks and magnetically-dominated star surfaces. We will treat the dynamo problem in both laboratory (magnetically dominated) and astrophysical (flow-dominated) plasmas from a common perspective. The constraint imposed by magnetic helicity conservation on the alpha effect, the correlated flow and magnetic field fluctuations, is considered for the two important, and very different, examples of tearing instability in laboratory plasmas and magneto-rotational instability in flow-driven astrophysical disks. Through direct numerical simulations, the role of magnetic helicity fluxes on the alpha effect and the final sustainment of large-scale magnetic field will be examined. For the two examples of an unstratified Keplerian cylinder and a reversed-field pinch, a dominant contribution to the alpha effect, in the functional form of a total divergence of an averaged helicity flux, called the helicity-flux-driven alpha effect, will be demonstrated. For the second example the results will be compared with MST data. The effect of averaging (both temporal and spatial) on the results for the helicity fluxes will be discussed. Supported by CMSO and DE-FG02-12ER55142.

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