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Shear-Driven Dynamo Waves in Fully Nonlinear Regime PEERA PONGKITIWANICHAKUL, FAUSTO CATTANEO, Univ of Chicago, GIUSEPPINA NIGRO, University of Calabria, Italy — Dynamo action is often invoked to explain the origin of magnetic fields in astrophysics. Often, the generated magnetic fields are organized on spatial and temporal scales much larger than that of the underlying turbulence. This process of large-scale dynamo action is well understood when the magnetic Reynolds number is small or moderate, but not as clear when the magnetic Reynolds number becomes large. In this regime, the fluctuations control the operation of the dynamo obscuring the large-scale behavior. Recently, Tobias and Cattaneo (2013) developed a dynamo model involving strongly helical flows and large scale shear that could generate well organized large-scale magnetic fields in the form of a traveling dynamo waves. Their model, however, was only kinematic, and did not include the back reaction of the Lorentz force on the flow. Here, we have undertaken a systematic extension of their work to the fully nonlinear regime. Helical turbulence, and large scale shear are produced self-consistently by prescribing body forces that, in the kinematic regime replicate the original velocity used by Tobias & Cattaneo. I will present results in the nonlinear regime for different magnetic Prandtl numbers and show different cases of large-scale organization.

Peera Pongkitiwanichakul
Univ of Chicago

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