Abstract Submitted
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Magnetohydrodynamic simulations of a magnetized spherical couette experiment[1] ELLIOT KAPLAN, HENRI-CLAUDE NATAF, NATHANAEL SCHAEFFER, Insitut des Science de la Terre — Magnetized spherical Couette flow is a common test bed for studying astro- and geophysically relevant magnetohydrodynamics. A magnetic field is applied to an electrically conductive fluid lying between two co- or counterrotating spheres, and the flow and the magnetic fields influence each other in subtle or dramatic ways. One such experiment, the Derviche Tourneur Sodium experiment (DTS-Ω) recently went through a set of upgrades to better characterize the flows and induced magnetic fields. In tandem with the upgrades, a set of direct numerical simulations were run with the XSHELLS code to give a more complete view of the fluid and magnetic dynamics at various rotation rates of the inner and outer spheres. XSHELLS is a highly efficient hybrid finite-diference pseudospectral solver of the coupled Navier-Stokes and magnetic induction equations. These simulations reveal several dynamic regimes determined by the Rossby number ($Ro = \Delta\Omega/\Omega_o$). These include quasigeostrophic flows, saturated hydrodynamic instabilities, and long lived filamentary structures. By comparing the high spatial resolution measurements of the simulation with the long duration measurements of the experiment, we can get a more complete picture of the dynamic system we're exploring.

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