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Dynamos in spherical time-periodic flows[1] IVAN KHALZOV, BEN BROWN, CARY FOREST, University of Wisconsin-Madison — We study numerically the possibility of dynamo action for a class of time-periodic, axisymmetric flows of conducting fluid confined inside a sphere. The flows are found as solutions to the Navier-Stokes equation subject to the boundary conditions specified by time-dependent profiles of azimuthal velocity at the sphere. This model is relevant to Madison plasma dynamo experiment (MPDX), whose spherical boundary is capable of differential driving of plasma in the azimuthal direction. We show that a growing magnetic field can be self-excited for a particular range of flow parameters, such as amplitude and frequency of flow oscillations, fluid Reynolds and magnetic Reynolds numbers. Simulations are performed using the magnetohydrodynamic codes NIMROD and DYNAMO. Both linear and nonlinear regimes of the dynamo instability are studied, effects of the finite wall resistivity are taken into account. Based on the results we propose a scenario for experimental demonstration of the dynamo action in MPDX.

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