

Progress towards the inertialess inviscid dynamo 2

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The Taylor state dynamo is understood as a reasonable approximation to Earth's dynamo system, in which the Coriolis, pressure and Lorentz forces dominate in Earth's core and the inertial force and viscous force are negligible. Taylor (1963) first proved the rationale of this theoretical limit and provided the mathematical proof and the initial numerical recipe for solving it. However, this approach exhibits considerable difficulties for a numerical scheme. We introduce a new approach for computing the Taylor state dynamo by utilizing the concept of the optimal control theory, such that Taylor state is satisfied in the entire simulation time window. We demonstrate our method in an illustrative 2D mean field dynamo and compare the numerical solution with the solution from torsional wave model of very small inertial.
