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Two-dimensional Simulations of Magnetorotational Instability in a Magnetized Couette Flow WEI LIU, JEREMY GOODMAN, Princeton University, HANTAO JI, PPPL — In preparation for an experimental study of magnetorotational instability (MRI) in liquid metal, we present non-ideal two-dimensional magnetohydrodynamic simulations of the nonlinear evolution of MRI in the experimental geometry. The simulations adopt initially uniform vertical magnetic fields, conducting or insulating radial boundaries, and periodic vertical boundary conditions. No-slip conditions are imposed at the cylinders. We focus on the dependence of the MRI growth rate and angular momentum transport rates on Reynolds number and magnetic Reynolds number. Our growth rates compare well with existing local and global linear analysis. The nonlinear final state is steady and almost independent of resistivity for magnetic Reynolds numbers in the range 200 $\leq\leq$ 800, although resistivity does influence the rate of evolution. A possible mechanism of nonlinear saturation is discussed. In addition, we study boundary conditions closer to those of the planned experiment such as radially conducting, vertically insulating boundary condition and full insulating boundary condition. Initial results on magnetic Ekman circulation and magnetic Stewartson layer as well as those on MRI, will be reported. This work is supported by the US Department of Energy, NASA under grant ATP03-0084-0106 and APRA04-0000-0152 and also by the National Science Foundation under grant AST-0205903.

Wei Liu
Princeton University

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