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Nonlocal Studies of the Magnetorotational Instability A. BHATTACHARJEE, F. EBRAHIMI, B. LEFEBVRE, A. VANDENBERG, Center for Integrated Computation and Analysis of Reconnection and Turbulence, University of New Hampshire — Viewed from the perspective of nonlocal studies of plasmas with sheared flows, the magnetorotational instability (MRI) is an important member of a larger family of shear- driven instabilities in a magnetized disk. A comprehensive analytical and numerical approach to these instabilities was first developed by Hameiri (1976) and Bondeson and coworkers (1987) with applications to fusion plasmas, and more recently applied by Keppens and cooworkers (2002) to Keplerian disks. The general framework uncovers a number of new features that must be included in our understanding of the linear as well as well as nonlinear evolution of the MRI. These include (1) overstability due the presence of compressibility for non-axisymmetric modes, and (2) the presence of an infinite sequence of discrete unstable modes accumulating toward the edge of the slow wave continuum at the Doppler-shifted frequency, regardless of the pressure gradient. For linear studies of these nonlocal instabilities, we present numerical results from a linear eignemode solver, and compare the predictions with NIMROD. We then use NIMROD to examine the consequences of these nonlocal instabilities for the nonlinear evolution of the MRI, where coupling to non-axisymmetric modes has already been shown to play an important role in the saturation of the instability.

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