Nonlinear saturation of the magneto-rotational instability (MRI).

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ABSTRACT

We show, by using asymptotical techniques, that the linear MRI, in a magnetized rotating shear flow in a thin annulus, nonlinearly saturates at an amplitude that scales like a power of the magnetic Prandtl number $A_s \sim \mathrm{P_m}^{\kappa}$ (with $\kappa \sim 1/2 - 2/3$, depending on boundary conditions). This result has consequences for angular momentum transport and experimental results for these flows. In addition, it calls for critical examination of numerical strategies to faithfully simulate such flows as well as accretion disks.

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