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Magnetorotational Dynamo Action in the Shearing Box[1] JUSTIN WALKER, STANISLAV BOLDYREV, Univ of Wisconsin, Madison — Magnetic dynamo action caused by the magnetorotational instability is studied in the shearing-box approximation with no imposed net magnetic flux. Consistent with recent studies, the dynamo action is found to be sensitive to the aspect ratio of the box: it is much easier to obtain in tall boxes (stretched in the direction normal to the disk plane) than in long boxes (stretched in the radial direction). Our direct numerical simulations indicate that the dynamo is possible in both cases, given a large enough magnetic Reynolds number. To explain the relatively larger effort required to obtain the dynamo action in a long box, we propose that the turbulent eddies caused by the instability most efficiently fold and mix the magnetic field lines in the radial direction. As a result, in the long box the scale of the generated strong azimuthal (stream-wise directed) magnetic field is always comparable to the scale of the turbulent eddies. In contrast, in the tall box the azimuthal magnetic flux spreads in the vertical direction over a distance exceeding the scale of the turbulent eddies. As a result, different vertical sections of the tall box are permeated by large-scale nonzero azimuthal magnetic fluxes, facilitating the instability.

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