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Turbulence and Dynamos in a Rotating Disks KRISTA MARTOCCI, FAUSTO CATTANEO, University of Chicago, Department of Astronomy and Astrophysics, PAUL FISCHER, ALEKSANDR OBABKO, Argonne National Laboratory — We present numerical evidence for large-scale dynamo action in a rotating disk. The results are from our three-dimensional, global simulations of magnetized cylindrical Couette flow at high Reynolds numbers. The rotation profile of our set up is hydrodynamically stable, but hydromagnetically unstable. Therefore, only if a disk is magnetized will drive turbulence, which is necessary for efficient angular momentum transport. This leads to the question of whether these unstable disks can self magnetize or sustain dynamo action. In other words, can this turbulence generate and increase the magnetic fields necessary to continue driving the turbulence? The nonlinear evolution of the system leads to a sustained turbulent state capable of generating strong, coherent azimuthal magnetic structures. Cyclic behavior, in which these structures are formed and destroyed, is apparent in the simulations. The Maxwell stresses associated with the magnetic structures are largely responsible for the outward transport of angular momentum. We will discuss how this turbulent transport is affected by changes in the geometry, in particular, flattening to a more disk-like shape. The implications for astrophysical disks will also be discussed.

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