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Experimental studies of magnetorotational instability in differentially rotating cylindrical flows BARBARA BRAWN, DANIEL LATHROP, Institute for Research in Electronics and Applied Physics, University of Maryland — Given the ubiquity of rotating disks in the observable universe (e.g., galaxies, planetary rings, protoplanetary disks and accretion disks around compact objects), understanding differentially rotating, electrically conducting flows is of considerable astrophysical interest. Theoretical and numerical studies indicate that infall and accretion of orbiting material can result from a so-called magnetorotational instability (MRI) arising in such flows. Recent experimental work suggests that MRI is observable in a laboratory setting; inspired by these observations, we are building a sodium Taylor-Couette experiment, comprised of a stationary 30 cm diameter outer cylinder and a rotating 15 cm diameter inner cylinder, with liquid sodium filling the gap between the cylinders. Numerical studies indicate that MRI arises in this geometry in the presence of an external magnetic field; we will impose on the sodium flow a uniform axial magnetic field produced by Helmholtz coils at either end of the experiment. We will use ultrasound Doppler velocimetry to examine the turbulent sodium flow, and a Hall probe array to examine the induced magnetic field of the system, and will relate our observations to theoretical and numerical expectations.

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