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Hydromagnetic Dynamics and Magnetic Field Enhancement in a Turbulent Spherical Couette Experiment D.S. STONE, Q. LIU, D.S. ZIMMERMAN, University of Maryland College Park, S.A. TRIANA, Institute of Astronomy KU Leuven, H.C. NATAF, Univ. Grenoble Alpes, D.P. LATHROP, University of Maryland College Park — The University of Maryland Three Meter Geodynamo, a spherical Couette experiment filled with liquid sodium and geometrically similar to the earth's core, is used to study hydrodynamic and hydromagnetic phenomena in rapidly rotating turbulence. Turbulent flow is driven in the sodium by differential rotation of the inner and outer spherical shells, while an external coil applies a magnetic field in order to study hydromagnetic effects relevant to the earth's outer core such as dynamo action. An array of 31 external Hall sensors measures the Gauss coefficients of the resulting magnetic field. The flow state is strongly dependent on Rossby number $Ro = (\Omega_I - \Omega_O)/\Omega_O$, where Ω_I and Ω_O are the inner and outer sphere rotation frequencies. The flow state is inferred from the torque required to drive the inner sphere and the generation of internal toroidal magnetic field through the Ω-effect, which is measured by a Hall probe inserted into the sodium. A self-sustaining dynamo has not yet been observed at rotation speeds up to about half of the design maximum. However, continuous dipole amplification up to 12% of a small applied field has been observed at $Ro = -17.7$ while bursts of dipole field have been observed up to 15% of a large external applied field at $Ro = +6.0$ and up to 20% of a small applied field at $Ro = +2.15$.

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