Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

A hydromagnetic spherical Couette experiment with a soft iron core DOUGLAS H. KELLEY, DANIEL S. ZIMMERMAN, SANTIAGO ANDRÉS TRIANA, DANIEL P. LATHROP, University of Maryland — Understanding the geodynamo remains a central pursuit of Earth science. Increasingly powerful numerical simulations and the experimental generation of a magnetic field by a Von Kármán flow raise questions about the roles of turbulence and ferromagnetic materials. We present experimental studies of 110 L of conductive fluid (sodium) in a differentially rotating spherical Couette cell with Earth-like geometry. The inner boundary is ferromagnetic soft iron, which has large permittivity but small remembrance, and which was chosen in an attempt to better understand the results of Monchaux *et. al* (2007). We measure magnetic induction via an array of Hall probes and project the data onto the vector spherical harmonics up to degree four, producing time series of Gauss coefficients. Varying the Ekman number, rotation rate ratio, and magnetic Reynolds number, we observe a variety of behaviors, including large induced fields, large resulting torques, intermittent broadband induction, Earth-like dipolar fields, and bistability.

Douglas H. Kelley
University of Maryland

Date submitted: 04 Aug 2008 Electronic form version 1.4