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A New Hope for Dynamo Action in the Three-Meter Model of Earths Core: Increasing Helicity.[1] RUBEN ROJAS, ARTUR PEREVALOV, DANIEL LATHROP, University of Maryland, College Park — The dynamo generation of magnetic fields in turbulent flows of conducting fluids and plasmas is an important feature of stars and planetary cores. Our Three-Meter diameter spherical Couette experiment uses liquid sodium to mimic some of the dynamics of these flows, giving insight into these natural phenomena. While we have seen substantial magnetic field gain, dynamo states have yet not been achieved. Numerical studies of Finke and Tilgner (Phys. Rev. E, 86:016310, 2012) suggest roughening the inner sphere, which can be achieved by adding baffles on the inner sphere. Those studies showed a reduction in the threshold for dynamo action by increasing the poloidal flows with respect to the zonal flows and hence increasing helicity. Thus, we seek to achieve a dynamo state in our three-meter experiment by adding baffles on the inner sphere. In this work, we use a 40-cm spherical Couette water apparatus to characterize the effect of different baffle designs on flow dynamics. We present velocity profiles and torque measurements which give us insight into baffle design of the three-meter experiment. We propose a new baffle design that improves the likelihood of observing dynamo action by breaking the symmetry in parameter space of the experiment and generating flows of different topology.

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