

## **Rotating turbulence and precession in a laboratory model of the Earth's core**

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We present an experimental characterization of fluid turbulence in a model of the Earth's core.

Our initial scientific study of the flows in water (taken prior to the changeover to liquid sodium) between our model core-mantle boundary (3 m in diameter) and inner core (1 m diameter) show a rich variety of states depending upon the boundary rotation rates. We obtain turbulent flows even when the inner and outer boundaries are locked together and rotated at a steady speed. Those flows are driven by the precession of the spin axis by the Earth's rotation of the laboratory. We compare our observations with prior theoretical studies of precessional flows. At modest differential rotation rates we also study rotating turbulent flows that show inertial modes, bi-stability, and a turbulent Stewartson layer. As equivalent observations of local, fluctuating quantities are unobtainable for the Earth or other planetary core flows, we thereby hope our studies will assist theoretical advances in understanding rotating turbulent planetary flows.