Abstract Submitted
for the TSF15 Meeting of
The American Physical Society

Modeling the fluid dynamics of a protoplanetary disk in a tabletop experiment RUY IBANEZ, Baylor University, BRUCE RODENBORN, Centre College, HARRY SWINNEY, University of Texas - Austin — In 2001 Molemaker et al. (*J. Fluid. Mech.* **448**, 1) predicted a new class of instabilities in a system of concentric rotating cylinders that contains a fluid with a vertically varying density. Dubrulle et al. (*Astron. Astrophys.* **429**, 1, 2005) then showed that this phenomenon, which they named stratorotational instability (SRI), could be a source of instability and angular momentum transport in astrophysical accretion disks. Such a flow has strong Coriolis forces, velocity shear and a vertical density gradient, which are properties shared by protoplanetary accretion disks. Our understanding of these processes in a laboratory system may lend insights into the means by which angular momentum is transported radially outward in accretion disks. Our observations suggest that current theory breaks down for high rotation rates and strong density gradients. Instead, we observe a new state that may show the onset of turbulence. We also study the temporal and spatial characteristics of the SRI, which generates a spiral pattern. We find that the spatial wavelength depends on the rotation rate and density variation, while the temporal frequencies are approximately multiples of the average rotation frequency of the inner and outer cylinder.

Ruy Ibanez
Baylor University

Date submitted: 03 Oct 2015 Electronic form version 1.4