

Abstract Submitted
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Observation of the Stratorotational Instability in Flow between Rotating Concentric Cylinders.¹ RUY IBANEZ, BRUCE RODENBORN, HARRY SWINNEY, The University of Texas At Austin — We present a laboratory model of rotating protoplanetary disks. The study is motivated by the need for understanding the fluid instabilities that are involved in the formation of planets. We examine instability in a fluid contained between concentric cylinders as a function of the ratio of cylinder rotation rates, $\mu = \Omega_{outer}/\Omega_{inner}$. This “Stratorotational Instability” (SRI) occurs in rotating sheared flows with an axial density dependence. In our experiment a fluid density that decreases exponentially with height is achieved by using water that is very salty at the bottom of the fluid annulus and pure water at the top of the cylinder. Disturbances in this density-stratified fluid oscillate with a natural “buoyancy frequency” N , which is varied in the range 0.25-1 Hz. We visualize the flow with a suspension of 25 μm diameter flakes and make digital movies that are analyzed using temporal and spatial Fast Fourier Transforms in order to determine the onset of instability. For each instability we find the axial wavenumber is proportional to Ω_{inner}/N . We also find that, contrary to theory,² the SRI instability occurs for $\mu > \eta$, where η is the ratio of the radii of the two cylinders.

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²D A Shalybkov, *Physics Uspekhi* **52**, 915 (2009).

Harry Swinney
The University of Texas At Austin

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