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Observation of the Stratorotational Instability in Flow between Rotating Concentric Cylinders[1] RUY IBANEZ, HARRY L. SWINNEY, University of Texas at Austin, BRUCE RODENBORN, Centre College — We study the stratorotational instability in a Taylor-Couette system with a radius ratio $\eta = r_o/r_i = 0.877$. The system is vertically stratified with a constant buoyancy frequency, $N = \sqrt{-(g/\rho_o)(\partial\rho/\partial z)}$. We determine when the flow becomes unstable as the ratio of the outer to inner cylinder rotation rates, $\mu = \Omega_o/\Omega_i$, is decreased from unity (solid body rotation), for Reynolds numbers $Re = \Omega_i r_i(r_o - r_i)/\nu$ ranging from 450 to 4000 and $N/2\pi = 0.3$ to 1.0 Hz. The axial and azimuthal frequencies, obtained from spatiotemporal spectral analysis of digital movies, yield the observed modes at different Re and μ for fixed N. We find for sufficiently large buoyancy frequency, $N/2\pi > 0.5$ Hz, the stratorotational instability occurs even above the $\mu = \eta$ stability limit obtained from theory developed in the Boussinesq (small N) approximation [cf. the review by D A Shalybkov, *Physics Uspekhi* **52**, 915 (2009)]. The frequencies we obtain for the azimuthal modes are close to multiples of the average frequency of rotation of the cylinders, while the axial wavelengths are found to vary linearly with Froude number, $Fr = \Omega_i/N$.

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