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Turbulent Taylor-Couette flow between independently rotating cylinders MATTHEW S. PAOLETTI, DANIEL P. LATHROP, University of Maryland — We present experimental studies of the turbulent flow of water between independently rotating cylinders. The Taylor-Couette system is capable of both strong turbulence ($Re > 10^6$) and rapid rotation ($\mathrm{Ek} < 10^{-7}$). The torque required to drive the inner cylinder is precisely measured as a function of the two angular velocities Ω_i and Ω_o. Of particular interest are three distinct regions of the (Ω_i, Ω_o) parameter space defined by the inner and outer boundaries having equal: (*i*) angular velocities (solid-body rotation), (*ii*) azimuthal velocities and (*iii*) angular momenta (Rayleigh criterion) with the outer boundary stationary line ($\Omega_o = 0$) serving as the final bound. We supplement the global torque measurements with local wall shear stress measurements as a means of detecting Coriolis-restored, linear inertial modes. We model the system as being composed of two interacting, turbulent boundary layers. There are several open questions that we hope to be able to answer: (1) Are there conditions under which angular momentum will flow uphill? (2) What quantity (angular velocity, azimuthal velocity, or angular momentum) does the system most effectively "mix," and does that depend upon system parameters.

Matthew S. Paoletti
University of Maryland

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