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Experimental Study of Effects due to Perturbations on Boundary Conditions on Couette Flows F. MANLEY, H. JI, M. BURIN, E. SCHARTMAN, M. NORNBERG, A. ROACH, PPPL, MRI TEAM — When fluid flows between two independently rotating cylinders at low aspect ratios (the ratio of the height to the difference in radii), the flow is seen to deviate substantially from ideal Couette flow due to Ekman circulation along the end caps. In the case where the end caps are attached to the outer cylinder, fluid with less angular momentum is advected into the bulk flow, which decreases the mean velocity as predicted by the ideal case. In order to study the stability of Ekman circulation, an experiment was devised to perturb the Ekman boundary layer by modifying the inner cylinder. Water flows between an aluminum inner cylinder and acrylic outer cylinder and its velocity is measured using a Laser Doppler Velocimeter (LDV) scanned radially from underneath to obtain 2-D velocity profiles. When the inner cylinder is perturbed, the flow is closer to the ideal Couette case if Ekman circulation is reduced. The robustness of the Ekman layer along with flow discontinuities at the edges where the inner and outer cylinder meet will be studied against perturbations of varying magnitudes.

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