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Effect of radius ratio on flow transitions in Newtonian Taylor-Couette flows CARI DUTCHER, SUSAN MULLER, University of California, Berkeley — In this study, a dozen flow state bifurcations have been mapped for a Newtonian fluid in a Taylor-Couette geometry of radius ratio 0.912 and aspect ratio of 60.7 using flow visualization in 2D planes of radial, axial, projected azimuthal and time dimensions. The resultant flow state transitions are compared to previous stability mappings obtained at various radius ratios. As a result, the effect of gap size is illuminated for various flow transitions, including transitions to axisymmetric, wavy, spiraling and/or turbulent modes. While many flow types have been previously observed, we report new sequences of bifurcations in the counter-rotating Taylor-Couette regime as well as track the vortex growth dynamics. In addition, the existing primary stability boundary data were found to be self-similar in radius ratio with respect to a properly chosen parameter space. Using the combination of variables technique, for both counter-rotating and co-rotating cylinders, curves were then empirically fit for explicit analytic formulae, $Re_c(\eta, \mu)$. Excellent quantitative agreement was found with data across the whole parameter space.

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