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Comparison of FDM & FEM Simulations of Rotating-lid Driven Cylindrical Flows. MICHAEL BRAZELL, ERIK DURKISH, BRIAN HELENBROOK, DANIEL T. VALENTINE, Clarkson University — Steady-state solutions of lid-driven rotating flows in cylindrical containers were computed to compare results from the ETUDE-in-R finite difference method (FDM) and an *hp* finite element method. The FDM method was used to solve for the azimuthal components of vorticity and velocity, and the meridional stream function. The *hp* method was used to solve for the pressure and velocity. The computed flow fields are axisymmetric approximations of the Navier- Stokes equations. The test case is a container with aspect ratio of 2.5 and a Reynolds number of 2200. Comparison of the results of the two methods is consistent. The centerline velocity profile and the shape of the two-breakdown-bubble flow visualization compare favorably with the numerical predictions. Results are also reported for a three-breakdown-bubble experiment for aspect ratio of 3.3 and Reynolds number of 2780. The Lamb vector and the helicity density are examined to provide further insight into these flows.

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