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Comparison of Linear Stability and 3-D Time Integration for Predicting Instabilities in a Thermocapillary Driven Liquid Bridge with Magnetic Stabilization[1] KENNETH DAVIS, YUE HUANG, BRENT HOUCHENS, Rice University — Flow in a cylindrical liquid bridge is driven by thermocapillary effects arising from a temperature gradient applied on the free surface. When the temperature difference is small and axisymmetric, the base flow will also be axisymmetric. However, as the temperature difference increases the flow becomes susceptible to three-dimensional instabilities, the first of which is either stationary or periodic depending on the Prandtl number of the liquid bridge. Instabilities predicted by linear stability theory are compared with those found using three-dimensional time integrations for low Prandtl number liquid bridges. Comparisons are drawn between spectral collocation and spectral element simulations, in terms of accuracy and computational efficiency. The impact of stabilizing the base state by applying a steady, axial magnetic field is also investigated.

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