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Finite-amplitude dynamics of coupled cylindrical menisci BRENTON COX, PAUL STEEN, Cornell University — In the planar-flow casting process where a thin ribbon is solidified as product, surface tension holds liquid metal in a "puddle." A defect appearing in the ribbon motivates this study of the interfacial dynamics of coupled menisci, an idealization of the puddle region. In this idealization, a meniscus is pinned at either end of a rectangular slot and these interfaces communicate through the inviscid liquid in the slot between. Capillary forces are assumed dominant and the menisci are assumed circular in cross-section. The resulting model has a Hamiltonian structure, showing dynamical behavior like the Duffing-oscillator. The energy landscape has a single- and double-welled potential depending on the total liquid volume (a bifurcation parameter). The response to small and large disturbances is studied using linear and weakly-nonlinear stability analyses and simulations. For large enough disturbances, the interfaces are expected to break and predicting this "blow-out" event is of interest with possible relevance to the industrial process.

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