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Burning invariant manifolds in time-periodic and time-aperiodic vortex flows[1] SAVANNAH GOWEN[2], TOM SOLOMON, Bucknell University —
We present experiments that study reaction fronts in a flow composed of a single, translating vortex. The fronts are produced by the excitable Belousov-Zhabotinsky (BZ) chemical reaction, and the vortex flow is driven magnetohydrodynamically by a radial current in a thin fluid layer above a Nd-Fe-Bo magnet. The magnet is mounted on a pair of perpendicular translation stages, allowing for controlled, two-dimensional movement of the magnet and the resulting vortex. We study reaction fronts that pin to the vortex for time-independent flows (produced by moving the vortex with a constant velocity) and for time-periodic and time-aperiodic flows produced by oscillating the vortex laterally. The steady-state front shape is analyzed in terms of *burning invariant manifolds*[3] (BIMs) that act as one-way barriers against any propagating reaction fronts. For time independent and time-periodic flows, the location of the BIMs are calculated numerically and are compared with experimental images of the pinned reaction fronts. We investigate extensions of this BIM approach for analyzing fronts in time-aperiodic flows.

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[3]J. Mahoney, D. Bargteil, M. Kingsbury, K. Mitchell and T. Solomon, Europhys. Lett. **98**, 44005 (2012).

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