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Manifolds and front propagation barriers in advection-reaction-diffusion systems[1] TOM SOLOMON, Bucknell University — We present experiments on the propagation of reaction fronts in laminar, vortex-dominated flows. The fronts are produced by the excitable Belousov-Zhabotinsky chemical reaction. The flows studied are driven by magnetohydrodynamic forcing techniques and are composed of a single vortex, chains or arrays of vortices, or spatially-disordered flows. In all of these cases, one-way barriers appear that either inhibit front propagation or, in some cases, pin the reactions fronts. We analyze this behavior with a recent theory of *burning invariant manifolds*[2] (BIMs) that are a generalization of the theory of invariant manifolds developed in the past to characterize chaotic mixing and transport of passive impurities. We demonstrate that the BIMs are responsible for the reaction barriers observed experimentally, and we discuss the applicability of this BIM formalism to a range of flows: time-independent, time-periodic and time-aperiodic.

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

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