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Chaotic mixing and front propagation in a three-dimensional flow[1] SARAH HOLLER, TOM SOLOMON, Bucknell University — We present experiments on passive mixing and on the behavior of the excitable Belousov-Zhabotinsky (BZ) chemical reaction in a time-independent, three-dimensional (3D) flow. The flow is composed of nested horizontal and vertical chains of vortices, a flow that has been shown[2] numerically to produce chaotic mixing with a complicated structure of ordered and chaotic regions. We study mixing experimentally by tracking neutrally-buoyant tracer particles in 3D and by imaging the evolution of a fluorescent dye with a scanning laser technique. The same scanning technique enables us to image fronts of the Ruthenium-catalyzed BZ reaction in the same flow. We analyze the behavior of these fronts with an extension of a theory of *burning invariant manifolds* [3] that has been shown to predict accurately the locations of barriers that impede reaction fronts in 2D flows.

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[2]M.A. Fogleman, M.J. Fawcett and T. H. Solomon, Phys. Rev. E **63**, 02101(R) (2001).
[3]J. Mahoney, D. Bargteil, M. Kingsbury, K. Mitchell and T. Solomon, Europhys. Lett. **98**, 44005 (2012).

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