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Burning invariant manifolds and reaction front barriers in three-dimensional vortex flows[1] JJ SIMONS, MINH DOAN, Bucknell University, KEVIN MITCHELL, UC-Merced, TOM SOLOMON, Bucknell University — We describe experiments on the effects of three-dimensional fluid advection on the motion of the excitable, Ruthenium-catalyzed Belousov-Zhabotinsky chemical reaction. The flow is a superposition of horizontal and vertical vortices produced by magnetohydrodynamic forcing and measured with particle image velocimetry. We visualize the propagating fronts in three dimensions with a scanning, laser-induced fluorescence technique that benefits from the fluorescence of the reduced Ru indicator. The experiments reveal a combination of tube- and sheet-like barriers that block the propagating reaction fronts. We study the dependence of the structure of these barriers on the front propagation speed (normalized by a characteristic flow velocity). The locations and blocking properties of these barriers are interpreted with a six-dimensional *burning invariant manifold*[2] theory that follows the evolution of front elements in the flow.

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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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