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Reaction front barriers in time aperiodic fluid flows. RORY LOCKE, KEVIN MITCHELL, University of California-Merced — Many chemical and biological systems can be characterized by the propagation of a front that separates different phases or species. One approach to formalizing a general theory is to apply frameworks developed in nonlinear dynamics. It has been shown that invariant manifolds form barriers to passive transport in time-dependent or time-periodic fluid flows. More recently, analogous manifolds termed burning- invariant-manifolds (BIMs), have been shown to form one-sided barriers to reaction fronts in advection-reaction-diffusion (ARD) systems. To model more realistic time-aperiodic systems, recent theoretical work has suggested that similar one-sided barriers, termed burning Lagrangian coherent structures (bLCSs), exist for fluid velocity data prescribed over a finite time interval. In this presentation, we use a stochastic wind to generate time dependence in a double-vortex channel flow and demonstrate the (locally) most attracting or repelling curves are the bLCSs.

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