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Pinning fronts in advection-reaction-diffusion systems: a dynamical systems approach[1] KEVIN MITCHELL, JOHN MAHONEY, JOHN LI, University of California, Merced — Recent experiments have demonstrated the pinning of reaction-diffusion fronts in magnetohydrodynamically-forced vortex flows. Specifically, a magnetic stage moving beneath the fluid layer "captures," and then drags, a reaction-diffusion pattern, which remains pinned to the frame of the stage. Here, we use dynamical systems techniques to explain the sequence of bifurcations that leads from an unpinned to a pinned state, as well as bifurcations that change the topological structure of the pinning fronts. We also explain how different pinning behavior can coexist within the same fluid flow, and analyze the associated basins of attraction. Our analysis is based on the recent concept of "burning" invariant manifolds (BIMs); BIMs extend the invariant manifolds traditionally used in passive advection to the case of reaction-diffusion systems.

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