Abstract Submitted
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Burning Invariant Manifold Theory and the Bipartite Digraph Representation of Generalized Dynamical System Formed by One-way Barriers[1] JOHN LI[2], University of Southern California, JOHN MAHONEY, KEVIN MITCHELL, University of California, Merced, TOM SOLOMON COLLABORATION[3] — The recently developed *Burning Invariant Manifold* (BIM) theory took a dynamical system approach to understand front propagation in *Advection-Reaction-Diffusion* systems and successfully predicted both the short-term and asymptotic front behavior by finding the unstable BIMs which act as barriers to front propagation. Unlike separatrices in traditional dynamical system being two-way barriers, the BIMs are one-way barriers. This asymmetry gives rise to a much richer dynamical behavior than traditional dynamical systems. Through numerical simulations, we found that the stable BIMs are the basin boundaries. Based on the properties of BIM theory, we further derived a theory to investigate a dynamical system consists of one-way barriers and the cooperative behavior of these barriers. This theory reveals the global structure of both stable and unstable BIMs by first using a systematic algorithm to convert the flow to a bipartite digraph and then extracting information of the steady states of fronts and corresponding basins of attraction from the digraph.

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[2]Previous Affiliation: University of California, Merced
[3]tsolomon@bucknell.edu Department of Physics & Astronomy Bucknell University

John Li
University of Southern California

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