

Abstract Submitted
for the NEF14 Meeting of
The American Physical Society

Bistable Dynamics in Chaotic Flow Structures¹ ADITYA DHUMUNTARAO, WENBO TANG, Arizona State University — A study of the interactions between turbulent stirring and biological processes is presented. Initial seeding of impurities in varying flow topological structures is shown to dictate the ultimate homogeneous state of the reaction scalar. In particular, hyperbolic and eddy flow structures were coupled with biological bistable dynamics to determine the ultimate state. For bistable equilibrium points, the elliptic flow structures help maintain scalar concentration and converge to one stable state. However, the hyperbolic flow structures contain high stretching regions which dilute the concentration and evolve the system to other stable state. Most importantly, the domain of attraction is critically determined by the underlying Lagrangian Coherent Structure (LCS). The domain convergence bifurcation used an underlying double gyre flow structure with varying Damköhler numbers.

¹We acknowledge support from NSF grant DMS-1212144 and DMS-1148771.

Aditya Dhumuntarao
Arizona State University

Date submitted: 19 Aug 2014

Electronic form version 1.4