Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Mixing Topology in a Flat Plate Paddle Mixer[1] NARATIP SANTITISSADEEKORN, ERIK BOLLT, DOUGLAS BOHL, Clarkson University — Using the experimental velocity field from a mixer with a flat plate impeller we aim to quantify the mixing in various notions and use it to study regions of strong mixing in our model. We would like to understand if there is some coherent structure that partitions regions corresponding to qualitatively different motions, such as the Lagrangian coherent structure (LCS). It is believed that understanding of transport and mixing can be accomplished by analysis the LCS based on the finite-time Lyapanov exponent (FTLE). For a steady flow, the LCSs give and empirical understanding of stable and unstable invariant manifolds of hyperbolic fix points. Stable and unstable manifolds which are co-dimension-1 constitute barriers to transport and, therefore, mixing in dynamical systems. LCS can be used to empirically infer such structures from experimental data. Specifically, two points straddling a repelling (contracting) LCS will eventually separate exponentially in a forward (backward) time.

[1]This work was supported by the CORE research program at NSWC Indian Head

Douglas Bohl
Clarkson University

Date submitted: 01 Aug 2007 Electronic form version 1.4