Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Stretching, break-up and coarsening in a flow with chaotic advection[1] TOM SOLOMON, JEFF BOEHMER, Bucknell University — We present experimental studies of the behavior of drops of an immiscible impurity in time-periodic flows that exhibit chaotic mixing. Two flows are used: a blinking vortex flow and a 2D array of oscillating vortices. The immiscible impurity is a fluorescent oil that floats in a thin layer on the surface of the flow. Large oil droplets are broken up by advection, whereas small droplet coalesce. The balance between these effects results in a distribution of oil droplets and tendrils. We measure the spectrum of this distribution and investigate how this spectrum evolves in time and varies with the strength of the flow. We also investigate the time-dependent stretching and relaxation of individual droplets, relating this behavior to the time-variation of a "Lagrangian Capillary Number" which is based on finite-time Lyapunov exponents.

[1]Supported by NSF Grants DMR-0404961, DMR-0703635 and PHY-0552790.

Tom Solomon
Bucknell University

Date submitted: 02 Aug 2007 Electronic form version 1.4