Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Lagrangian coherent structures as mesoscale transport barriers in atmospheric flows SHIBABRAT NAIK, SHANE ROSS, Biomedical Engineering and Mechanics, Engineering Science and Mechanics program, Virgnia Tech — Coherent structures in two-dimensional flows have long been studied in the context of transport in fluid dynamics. However, for geophysical systems a small vertical velocity can lead to nontrivial three-dimensional motion of airborne biological populations affecting agriculture or hazardous outputs from natural disasters. The pathways and barriers in the lower atmosphere, from ground level to a kilometer altitude and over a horizontal scale of several kilometers–which bridge the scale of, for example, local farmlands to the larger regional scale–are still unclear. This requires exploring relevant spatiotemporal scales related to advection in the space of 3D + time. In this talk, we will present the application of finite-time Lyapunov exponent based three-dimensional Lagrangian coherent structures (LCS) to address questions of transport using historical data sets from satellite observations, field measurements and the Weather Research and Forecasting (WRF) model.

Shibabrat Naik
Virginia Tech

Date submitted: 31 Jul 2015 Electronic form version 1.4