STEVENS Institute of Technology

Arthur E. Imperatore School of Sciences and Arts

Department of Mathematical Sciences

Seminar in Nonlinear Systems

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Lagrangian Coherent Structures in Ocean Flows: Applications to Directed Drifter Launch Strategies

Thursday, April 3, 2003
3:30 pm
Morton 101

Abstract: A basin scale, reduced gravity, primitive equation model is used to study how drifter launch strategies affect the accuracy of Eulerian velocity fields reconstructed from limited Lagrangian data. Optimal dispersion launch sites are found by tracking strongly hyperbolic singular points in the flow field. Lagrangian data from drifters launched from such locations are found to provide significant improvement in the reconstruction accuracy over similar but randomly located initial deployments. The eigenvalues of the hyperbolic singular points in the flow field determine the intensity of the local particle dispersion and thereby provide a natural time-scale for initializing subsequent launches. Aligning the initial drifter launch in each site along an out-flowing manifold insures both high initial particle dispersion and the eventual sampling of regions of high Lagrangian kinetic energy; two factors that are found to be critical to the accuracy of the Eulerian reconstruction. Similar ideas are extended to a data-assimilating numerical model of the Gulf of Mexico. Here the statistics of Lagrangian velocities sampled by sets of drifters launched in hyperbolic regions are found to compare well with the full, Eulerian velocity ensemble.

Andrew Poje's research interests cover several areas in geophysical fluid dynamics including transport and mixing, turbulence, non-linear dynamics, and numerical methods for partial differential equations. Dr. Poje received a Ph.D. in Mechanical Engineering from Cornell University. He held post-doctoral positions at Los Alamos National Laboratory (Institute for Geophysics and Planetary Physics), and Brown University (Division of Applied Mathematics). Dr. Poje is currently on the faculty at the Department of Mathematics, College of Staten Island, and the CUNY Graduate Faculty in Physics.

Refreshments at 3:15pm