Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

The role of filamentation and vortex merging in coastal particle accumulation and transport CHERYL HARRISON, University of California Santa Cruz, DAVID SIEGEL, University of California Santa Barbara, SATOSHI MITARAI, Okinawa Institute of Science and Technology — Understanding ocean transport of coastally released material is crucial for predicting planktonic and pollutant transport. Here we use a coupled particle-tracking/ocean circulation model of an upwelling current to identify important transport processes at meso- to submesoscales. Buoyant particles released over the continental shelf simulate surface following planktonic material. Particles are largely organized into filaments found between mesoscale eddies that correspond to attracting Lagrangian coherent structures (LCS), material curves that map filamentation and transport boundaries, and here correlate with temperature fronts and their associated secondary ageostrophic circulation. Filamentation and vortex merging reduce mixing, aggregating particles from many source regions and release times into small, highly dense packets. As predicted by structural stability of LCS, filaments and packets are robust to strong levels of random walk "swimming" perturbations, indicating these processes will be robust to a wide range of planktonic behavioral strategies. This study demonstrates that 1) coherent flow structures play an important role in pelagic transport of marine propagules, plankton and floating pollutants in the coastal ocean, and 2) dynamical systems techniques will have broad applicability in these systems.

Cheryl Harrison
University of California Santa Cruz

Date submitted: 02 Aug 2012 Electronic form version 1.4