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Transport boundaries in the Western Adriatic Current: Sensitivity to model resolution

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Recent investigations have shown that the basin scale relative dispersion statistics in the Adriatic are controlled to a large extent by the dynamics of the thin western boundary current (WAC). We investigate the Lagrangian transport and mixing in this region using a 1km resolution, data assimilating NCOM model. For particular time periods, the Lagrangian coherent structures in the WAC reveal a pattern of cat's eye features at the inner edge of the current with the unstable sets acting as perturbed hetero-clinic connections between strongly shearing hyperbolic trajectories. The role of these Lagrangian boundaries on the advective patterns, and ultimate transport, of model salinity fields is investigated for progressively coarser spatial resolution of the velocity fields. The organizing hyperbolic trajectories and their attending manifolds, persist even under rather coarse smoothing of the vector fields. The smoothing does, however, directly reduce local velocity gradients and hence separation time scales as measured by a variety of Lagrangian metrics. Finite time manifolds produced by the smoothed flow are shorter and significantly less foliated than those produced by the raw data. These results are consistent with the observations in Haza et al 2008. Large scale and long time Lagrangian relative dispersion statistics are dominated by identifiable hyperbolic structures in the flow that are relatively insensitive to the details of the small scale Eulerian velocity field. Spatial smoothing both reduces separation rates at small scales and extends to larger scales the exponential separation regime.