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Objective Eulerian Coherent Structures Predict Drifter Motion

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Recent results show that Objective Eulerian Coherent Structures (OECSs) (Serra, M. and Haller, G., Chaos 26(5), 2016) reveal the correct, frame-independent locations of instantaneous saddle-type material behavior in unsteady flows. Using an unsteady ocean surface velocity field reconstructed from high-frequency-radar measurements, we compute attracting OECSs in a region of the North-East coast of the US, where drifter trajectories are also available. Remarkably, we find that despite their non-passive and inertial dynamics, drifters align rapidly with nearby attracting OECSs. At the same time, the drifter attractors remain completely hidden in instantaneous streamlines plots and in the Okubo-Weiss field.