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Directed Drifter Launch Strategies for Lagrangian Data Assimilation Using Hyperbolic Trajectories

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The dependence of the fidelity of a Lagrangian data assimilation scheme on the initial launch locations of the observed drifters is studied in the context of a reduced gravity, primitive equation model of mid-latitude circulations. A directed launch strategy, based on tracking the Lagrangian manifolds emanating from strongly hyperbolic regions in the flow field, is developed. In a series of twin assimilation experiments, the convergence of the data assimilating scheme is shown to be consistently and significantly improved by such directed launches compared to randomly selected initial drifter positions. By directing initial drifter positions along the out-flowing branch of identifiable Lagrangian boundaries the relative dispersion of the drifters, the overall data-coverage and the sampling of high kinetic energy features in the flow are optimized. In general, the performance of the assimilation procedure is shown to depend strongly on the independence of the observed drifter trajectories and the temporal persistence of the corrections provided by the data.