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Calculations of Differential Kinematic Properties from Lagrangian Observations in the Western Caribbean Sea

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ABSTRACT

Observations of the motions of drifter clusters were made in the western Caribbean Sea during the summer of 1971. By two independent analyses of the relative motions of a cluster, two time series of horizontal divergence, vorticity, shear deformation rate, and normal deformation rate are developed. The results of the two approaches are very similar. The time series for these differential kinematic properties are fairly smooth when the drifters were moving in the Yucatan Current. Otherwise, the time series are ragged with frequent changes in sign. It is speculated that the raggedness is due to small values of the shear rates relative to random observational errors or small-scale turbulent processes. The records of the differential kinematic properties are used to evaluate the stretching and material derivative terms of the vorticity equation. Calculations indicate that potential vorticity is conserved along trajectories in the Yucatan Current.

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