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Inferring degree of mixing from sparse finite-time measurements of Lagrangian paths using braid dynamics MARKO BUDISIC, JEAN-LUC THIFFEAULT, Univ of Wisconsin, Madison — Detailed oceanic measurements, e.g., of temperature and salinity, are often taken by floats, sensors advected by oceans' currents. In addition to physical variables, floats record their own positions, resulting in abundance of data sets of float trajectories. Unfortunately, recent analysis techniques based on knowledge of velocity fields require much denser sampling of velocities than obtained by floats. We discuss braid dynamics, an approach that requires only Lagrangian paths as inputs and is therefore well-suited for analysis of float data. Braid analysis was previously successfully used to design paths of mechanical stirrers to optimize mixing in industrial applications. The difficulty with applying the technique to oceanic flows is that there are no known distinguished "stirrers" that induce the flow in the oceans. Consequently, instead of a single braid to be analyzed, a range of different braids can be generated by the same oceanic flow. The following questions arise: What kinds of braids can be sampled from a flow? Can a "typical" sampled braid be used to estimate actual mixing timescales? How do number and length of float paths affect the quality of the estimates? We present results based on theoretical and numerical analyses.

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