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Detecting Lagrangian coherent structures using isolated trajectory measure methods

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We introduce a family of methods, which we refer to as "isolated trajectory measure" (ITM) methods, that allow identification of Lagrangian coherent structures in aperiodic flows that are measured over finite time intervals. The new methods are based on properties of individual particle trajectories; we focus on arclength and correlation dimension but other related measures of trajectory complexity could also be used. The basic principles of the new methods are explained and the methods are successfully applied to identify Lagrangian Coherent Structures in three examples: a kinematic analytically-prescribed flow, a dynamically motivated analytically-prescribed flow, and a realistic numerically generated flow.