



Analyzing Fluid Flows and Understanding Transport via Ergodicity Defect Analysis

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We present here a multiscale technique for analyzing fluid flows. The method – called the ergodicity defect – draws on ideas and tools from ergodic theory, dynamical systems and harmonic analysis. The ergodicity defect is designed to capture the extent to which a flow or system departs from ergodicity and how this deviation depends on spatial scales. This approach has been successfully used in an ocean flow setting to distinguish trajectories in terms of the manner in which the trajectories cover the space –i.e. their complexity. This analysis of trajectory complexity allows for the identification of coherent structures and a subsequent understanding of transport in the flow. In this discussion we consider the theory behind the ergodicity defect, its application in the context of specific examples as well as how the ergodicity defect improves on traditional methods and can be used to gain insight into other aspects of fluid flow analysis.