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A Lagrangian Coherent Structures Analysis of the Unsteady Wake Behind a Circular Cylinder MATTHEW ROCKWOOD, Syracuse University, JACOB MORRIDA[1], Notre Dame, MELISSA GREEN, Syracuse University
— The experimentally measured unsteady wake behind a circular cylinder was studied and compared with numerical results. The location and evolution of coherent structures, or vortices, in the flow were analyzed to facilitate the understanding of the vortex shedding physics in the near wake region. This understanding is critical to the control of vortex shedding from bluff bodies. The two-component velocity data was collected using a DPIV measurement system, and Eulerian vortex criteria were applied along with a Lagrangian coherent structures (LCS) analysis to determine the properties of the wake. The LCS analysis utilizes the Finite Time Lyapunov Exponent (FTLE) method to objectively determine the locations of vortex boundaries in the flow. This technique offers new insight on the development of the unsteady wake, and shows an objective change in curvature of the LCS in the region where the new vortex will form before traditional Eulerian techniques show any changes. This information can be used to highlight regions to be targeted by flow control techniques.

[1]Work was completed as a student at Syracuse University.

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