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Lagrangian Proper Orthogonal Decomposition of the Wake Downstream of a Cylinder JACK ROSSETTI, Ph.D Student, Mechanical and Aerospace Engineering, Syracuse University, MELISSA GREEN, JOHN DANNENHOFFER, Associate Professor, Mechanical and Aerospace Engineering, Syracuse University — Proper orthogonal decomposition (POD) has long been utilized by the fluid dynamics community to extract information regarding the energy contained in the structures of turbulent flows. These POD techniques are generally executed in an Eulerian frame, encapsulating all the structures created and destroyed through time. Unfortunately, the mode shapes that Eulerian POD produce are linked to the translation of structures and little is learned about the evolution of individual structures. We overcome this by applying POD in a Lagrangian frame. We first track pertinent features through cross-correlation techniques. Both Eulerian and Lagrangian POD were tested on a CFD simulation of the wake downstream of a cylinder. Eulerian POD focuses on the large-scale von Karman vortex street, whereas the Lagrangian POD allows one to extract physical phenomena associated with each of the individual vortices. This can result in a better understanding of the physics within each vortex.

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