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Relating surface pressure to Lagrangian wake topology around a circular cylinder in cross flow[1] MATTHEW ROCKWOOD, MELISSA GREEN, Syracuse University — The tracks of Lagrangian saddles, identified as non-parallel intersections of positive and negative-time finite-time Lyapunov exponent (FTLE) ridges, have been shown to indicate the timing of von Karman vortex shedding in the wake of bluff bodies. The saddles are difficult to track in real-time, however, since future flow field data is needed for the computation of the FTLE fields. In order to detect the topological changes without direct access to the FTLE, the saddle dynamics are correlated to measurable surface quantities on a circular cylinder in cross flow. The Lagrangian saddle found upstream of a forming and subsequently shedding vortex has been shown to accelerate away from the cylinder surface as the vortex sheds. In previous numerical results at $Re = 150$, this acceleration coincides with the peak in lift force over the cylinder, and also with a minimum in the static pressure at a location slightly upstream of the mean separation location. In the current work, this result is compared with experimental data at $Re = O(10,000)$. Successful validation would provide a strategy for locating sensitive regions on the cylinder surface where vortex shedding could be detected using simple pressure transducers.

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