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Syracuse-Rensselaer-Stevens-CCNY-Polytechnic

Session DB - Turbulent Shear Layers.
ORAL session, Sunday afternoon, November 23
Diamond Court, Ballroom B, SMH

**[DB.007] POD analysis of PIV measurements in
complex near wake flows**

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Proper Orthogonal Decomposition analysis of PIV measurements is used to study the turbulent flow structure in the near wake of bluff bodies. Several body geometries are considered including two-dimensional cylindrical shapes, rounded-nose bluff bodies and typical road vehicle geometries. The main goal of the study is to determine the more energetic POD modes and associated unsteady flow, and the underlying near wake dynamics. We briefly review the results of POD analysis of PIV measurements in two-dimensional geometries. We show that in more complicated flow fields, different POD modes capture the turbulent energy in different regions of the wake. For example, in the flow over a pickup truck, modes 1 and 2 capture the turbulent structure in the underbody shear layer, while mode 4 captures the turbulent structure of the flow over the bed. This result has significant implications for flow control applications. The POD methodology is used to identify generic unsteady flow structures in the near wake. The dominant modes are an oscillation of the length of the recirculation region behind the body (breathing mode) and a lateral oscillation of the wake (flapping mode). In some cases a vortex shedding mode reminiscent of the Karman-Roshko structure in circular cylinders is also observed. Efforts to determine the dynamics of the experimentally measured POD modes are discussed.