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Application of Proper Orthogonal Decomposition to Disk Wakes

ZACHARY BERGER, AARON J. ORBAKER, MARK N. GLAUSER, HIROSHI HIGUCHI, MAKAN FARDAD, RORY BIGGER, Syracuse University — This work investigates the effects of flow control on the near wake region of a disk in a water flow utilizing the POD reconstructed time dependent velocity fields. Velocity measurements were collected using time resolved particle image velocimetry (TRPIV) at a Reynolds number of 20,000 based on the disk diameter both with and without control. Since this is a time resolved velocity data base we are able to reconstruct the time dependent velocity field in the wake for baseline and controlled cases using various POD truncations and observe velocity reconstructions. The current interest is in the convergence of the spatial eigenvalues of the baseline and controlled cases for the future development of closed-loop control systems from the perspective of the time dependent velocity field instead of just using the normal energy convergence criteria.

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