

Abstract Submitted
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Pressure-velocity correlations in a flow upstream of a forward-facing step DAVID PEARSON, Imperial College London, PAUL GOULART, ETH Zurich, BHARATHRAM GANAPATHISUBRAMANI, University of Southampton, IMPERIAL COLLEGE FLOW CONTROL GROUP TEAM — The 2-dimensional velocity field upstream of a forward step was determined experimentally using Particle Image Velocimetry. A total of 4 seconds of data was acquired at 8000Hz. The flow velocity was 10ms^{-1} with an Re_h of 20000, where $h = 0.03\text{m}$ is the step height. The boundary layer thickness relative to step height was $\delta/h = 1.6$. The upstream surface pressure fluctuations were simultaneously measured using an array of 9 microphones embedded in tunnel floor. These pressure fluctuations are shown to have a direct linear correlation to the velocity perturbations. The correlation has a maximum of approximately 0.3 at upstream stations $x/h > 2$ and reduces toward background noise levels as the flow approaches separation at $0.5 < x/h < 1.5$. It is also shown that large pressure fluctuations upstream correlate to changes in shape and structure of the separation region at the step. This data demonstrates the ability to estimate some flow characteristics at the step face from the oncoming boundary layer, through the use of pressure measurements at the wall.

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