

Abstract Submitted
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Effects of Spatial Alignment in Stereo Particle Image Velocimetry

BARTON SMITH, Utah State University, STEVEN BERESH, Sandia National Laboratory — We seek to quantify errors in stereo Particle Image Velocimetry (PIV) as a function of laser sheet thickness and camera angle. Simultaneous stereo PIV measurements of a simple free jet were obtained from narrow and wide camera angles while a fifth camera viewed the laser sheet from 90 degrees to determine the two-component velocity field free of errors resulting from stereo calibration. Errors in mean velocities were small, but artificially reduced turbulent stresses were generated when self-calibration was not used, owing to a smearing effect that occurs when the two cameras are inadequately registered to each other. This difficulty worsens with increased laser sheet thickness. Spatial error in the calibration process can artificially displace vector fields from the expected origin. Although this typically is small with respect to statistical properties of a data set, it can be prominent when instantaneous snapshots of the velocity field are examined, particularly where the velocity gradient is momentarily large. Furthermore, small scale structures present in the jet flow are distorted by the various PIV systems in a manner that depends on the sheet thickness and camera orientation.

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