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Uncertainty Estimation for 2D PIV: An In-Depth Comparative Analysis AARON BOOMSMA, TSI Inc, SYANTAN BHATTACHARYA, Purdue University, DAN TROOLIN, TSI Inc, PAVLOS VLACHOS, Purdue University, STAMATIOS POTHOS, TSI Inc — Uncertainty quantification methods have recently made great strides in accurately predicting uncertainties for planar PIV, and several different approaches are now documented. In the present study, we provide an analysis of these methods across different experiments and different PIV processing codes. To assess the performance of said methods, we follow the approach of Sciacchitano et al. (2015) and utilize two PIV measurement systems with overlapping fields of view—one acting as a reference (which is validated using simultaneous LDV measurements) and the other as a measurement system, paying close attention to the effects of interrogation window overlap and bias errors on the analysis. A total of three experiments were performed: a jet flow and a cylinder in cross flow at two Reynolds numbers. In brief, the standard coverages (68% confidence interval) ranged from approximately 65%-77% for PPR and MI methods, 40%-50% for image matching methods. We present an in-depth survey of both global (e.g., coverage and error histograms) and local (e.g., spatially varying statistics) parameters to examine the strengths and weaknesses of each method in monitor their responses to different regions of the experimental flows.

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