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Uncertainty of Reynolds Stresses from PIV Measurements[1] BARTON SMITH, JARON HOWELL, Utah State University — Particle Image Velocimetry measurements of fluid velocity have poor dynamic range and therefore have significant random error. Over the last seven years, excellent progress has been made toward estimating the random uncertainty of individual PIV vectors automatically in an a posteriori manner. In fact, two leading commercial PIV codes now have uncertainty estimation as an option in the vector calculation. The impact of random errors on the time-average of velocity is only to increase the number of data points required for convergence. However, other important fluid dynamics quantities, such as Reynolds normal stresses, will contain a bias error due to random errors in the vectors used to compute the quantity. If one has an accurate estimate of the instantaneous uncertainties, this bias may be estimated and removed. However, recent studies have shown that the performance of uncertainty estimation schemes varies depending on many factors and that no scheme is accurate in every case. In this presentation, we will discuss the impact of inaccurate estimation of instantaneous random uncertainty on the uncertainty of Reynolds stress.

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