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Energy dissipation rate measurements with PIV-PTV in a Partially Stirred Reactor (PaSR) LUMINITA DANAILA, CORIA Universite de Rouen , PAUL DIMOTAKIS, California Institute of Technology, BRUNO RENOU, JEAN-FRANCOIS KRAWCZYNSKI, CORIA Universite de Rouen — The work presented addresses some of the questions surrounding the experimental determination of the mean energy dissipation rate. The approach is based on a hybrid PIV-PTV (particle-tracking velocimetry) method. The flow investigated is in a Partially Stirred Reactor (PaSR) in which fluid is injected through 16 opposed jets that issue from top/bottom planes. PIV is first used to detect a locally averaged mean velocity of particle groups. A refined PTV algorithm is then used, with a resolution of $\sim$1 pixel, to determine the instantaneous, spatially resolved velocity field. Second-order structure functions are calculated as a function of spatial separation. Their small-scale limit provides estimates for the mean energy dissipation rate that are in good agreement with ones obtained from the inertial range of scales or very large scales (the last two are not affected by resolution). Three different methods allow for a proper determination of the dissipation rate, which is found to be 20 % greater than that inferred from PIV alone. Our results suggest an improved methodology for the estimation of instantaneous values and high-order, small-scale, velocity-field statistics.

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