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Hybrid PIV-Particle Tracking Technique Applied to High Reynolds Number Turbulent Boundary Layer Measurements[1] JULIO SORIA, CALLUM ATKINSON, NICOLAS BUCHMANN, Monash University — Zero-pressure gradient turbulent boundary layer (ZPGTBL) experiments in both the LTRAC water tunnel (LTRAC-WT) at Monash University and the University of Melbourne HRNTBL wind tunnel were undertaken up to $Re_\tau = 20,000$. Both experiments represent the flow along the centreline of each test section in the streamwise - wall-normal plane. Two PCO Dimax cameras with 2008×2008 pixel arrays were used in conjunction with a high-repetition laser to measure the time-resolved 2C-2D velocity field in the LTRAC-WT. The HRNTBL wind tunnel experiments employed nine PCO pro.4000 cameras each with a 4008×2672 pixel array. Two double cavity pulsed Nd:YAG lasers were used to acquire single-exposed PIV images simultaneously on all cameras to yield high spatial resolution 2C-2D velocity fields over a large extend of the ZPGTBL. In both cases, the single-exposed PIV images were analysed using multigrid cross-correlation PIV analysis, which has been enhanced to include a hybrid velocimetry step in which the PIV velocity is used as an estimator to a subsequent particle tracking refinement step. Statistics of the ZPGTBL velocity field as well as the high spatial resolution instantaneous structure and spatio-temporal structure of the ZPGTBL will be presented.

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