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Time-evolution of uniform momentum zones in a turbulent boundary layer ANGELIKI LASKARI, R. JASON HEARST, ROELAND DE KAT, BHARATHRAM GANAPATHISUBRAMANI, University of Southampton — Time-resolved planar particle image velocimetry (PIV) is used to analyse the organisation and evolution of uniform momentum zones (UMZs) in a turbulent boundary layer. Experiments were performed in a recirculating water tunnel on a streamwise–wall-normal plane extending approximately $0.5\delta \times 1.8\delta$, in x and y, respectively. In total 400,000 images were captured and for each of the resulting velocity fields, local peaks in the probability density distribution of the streamwise velocity were detected, indicating the instantaneous presence of UMZs throughout the boundary layer. The main characteristics of these zones are outlined and more specifically their velocity range and wall-normal extent. The variation of these characteristics with wall normal distance and total number of zones are also discussed. Exploiting the time information available, time-scales of zones that have a substantial coherence in time are analysed and results show that the zones' lifetime is dependent on both their momentum deficit level and the total number of zones present. Conditional averaging of the flow statistics seems to further indicate that a large number of zones is the result of a wall-dominant mechanism, while the opposite implies an outer-layer dominance.

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