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Internal shear layers and uniform momentum zones in a turbulent pipe flow MELIKA GUL, GERRIT E. ELSINGA, JERRY WESTERWEEL, Delft University of Technology — Turbulent pipe flow has previously been shown to contain large-scale nearly uniform momentum, which are separated by layers of significant shear. These internal layers are of interest, because they are associated with fluid transport between uniform momentum zones, hence with the growth of these large energy-containing motions. In this study, we compare two methods to detect and analyse the internal shear layers; the triple decomposition method (TDM) and the streamwise velocity histogram method. The assessment is based on time-resolved PIV measurements in the cross-section of the pipe spanning a range of Reynolds numbers (Re_τ =700-1178). The strong jumps in the conditionally averaged flow statistics across the layers detected by TDM are smeared out with the histogram method. Using the TDM method, some scaling analyses are performed for the layer thickness, and the velocity jump over the layer. It is found that the layer thickness becomes almost constant after 0.4R, and the streamwise velocity jump decreases from the wall region to the core of the pipe. With the histogram method, on the other hand, one distinct shear layer is distinguished from the distribution of all local peak velocities, which is corresponding to the 95% of the central velocity of the pipe.

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