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Estimation of wall-shear stress and its variation in a unperturbed and perturbed plane wall-jet[1] SRAVAN ARTHAM, Embry Riddle Aeronautical University, SHIBANI BHATT, Embry-Riddle Aeronautical University, ZHENG ZHANG, EBENEZER GNANAMANICKAM, Embry Riddle Aeronautical University — Artham Sravan, Shibani Bhatt and Ebenezer Gnanamanickam Measurement of the wall shear stress (WSS) were conducted using near-wall hot-wire anemometry based velocity measurements and a momentum integral based measurement using time-resolved particle image velocimetry (PIV) velocity fields. Measurements were carried out on a perturbed and unperturbed plane wall jet (PWJ) developing in still air. The plane wall jet was acoustically excited at frequencies from 1 to 20 Hz which are large-scale perturbations to the flow. Measurements from a single hot-wire were carried out in the near-wall region extending into the viscous sublayer at several streamwise locations extending from $x/b = 110$ to 162. Here x is the streamwise distance from the PWJ exit and b the nozzle slot width. These measurements were then curve-fit with direct numerical simulation based velocity profiles to simultaneously extract the WSS as well as a correction to the wall location. The integral method used a momentum integral approach (Mehdi, F. et al.,Exp. Fluids, 2014) where PIV based velocity profiles of the streamwise and wall-normal velocities are integrated to determine the WSS. A reduction in WSS was observed for all the cases considered. The two techniques are compared and key differences are highlighted.

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