

Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Momentum balance in wall jets T. GUNNAR JOHANSSON, Applied Mechanics Dept., Chalmers Univ of Technology, Göteborg, Sweden, FARAZ MEHDI, Dept. of Mechanical Engineering, Univ. of New Hampshire, Durham, NH, JONATHAN W. NAUGHTON, Dept. of Mechanical Engineering, Univ. of Wyoming, Laramie, WY — A plane wall jet experiment has been done to study its momentum balance. Two component laser Doppler anemometry was used to simultaneously measure the axial and wall-normal velocity components in 6 axial positions ($x/H= 25, 50, 75, 100, 125$ and 150) spanning from the wall all the way well into the ambient stagnant area. In this way not only the mean velocity components and Reynolds normal and shear stresses but also all their spatial derivatives were determined. In addition the wall shear stress was measured in all six axial positions using oil film interferometry. From these data all terms in the x-momentum equation, except the pressure term, could be evaluated. Later also the pressure was measured in the same profiles, and thereby also the pressure term was included in the balance. Contrary to common belief it was found that the pressure was not constant in the wall jet. The complete momentum balance is discussed and used to evaluate the roles played by the different contributing terms in different regions of the flow field in an effort to improve on our understanding of the mechanics of wall jets.

T. Gunnar Johansson
Applied Mechanics Dept., Chalmers Univ of Technology, Göteborg, Sweden

Date submitted: 10 Aug 2012

Electronic form version 1.4