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Turbulent structures in a wall jet SHIBANI BHATT, SRAVAN ARTHAM, REDA MANKBADI, EBENEZER GNANAMANICKAM, Embry-Riddle Aeronautical Univ — Wall Jets are special shear layers, in that they have two shear layers which arise from two different instability mechanisms, to form a single turbulent layer. The three-dimensional wall jet in addition has an inherent secondary flow which adds to the complexity of the flow physics. These jets finds wide use in heat transfer applications such as film cooling. However, the wall jet has received little attention when compared to the turbulent boundary layer, fully developed channel flow or a free jet. As part of this study hot-wire measurements were carried out in a three-dimensional wall jet. The eventual goal of this work is to study inner-outer interactions using the wall jet as the two shear layers affords the possibility of independent control. Velocity statistics as well as spectra derived from velocity measurements are presented. The wall jet is shown to have structures of longer wavelength in the outer free-jet region which arise from the inviscid instability of the free-jet layer. The near wall region of the wall jet, which arises from a viscous instability, is populated with finer structures similar to that seen in a turbulent boundary layer. The implications of these observations towards studying inner-outer interactions is also discussed.

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