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Fundamental Entrainment Observations (VSL, etc.) for a SSSL JOHN FOSS, Michigan State University, KYLE BADE, Spraying Systems Co., DOUGLAS NEAL, RICHARD PREVOST, LaVision Inc. — Fundamental observations of the entrainment process on the low speed side of a high Re self-preserving single stream shear layer have been made using PIV realizations. The Re value was: $U_0\theta_{mid}/\nu = 6.75{*}10^4$, where $\theta_{mid} = 13.7$ cm is the momentum thickness at the mid-location ($x/\theta(0) = 390$) of the observations. The VSL (Viscous Super Layer), 15-20 η_K thick, is bounded by a well-defined border where the non-vortical/vortical transition occurs. The Kolmogorov microscale (η_K) was determined from the mean-square vorticity adjacent to the VSL. A threshold level to define the border ($\omega_z\theta_{mid}/U_0 = 0.221$) was selected by examination of the data. Quantitative measures of the entrainment process have been obtained, including: i) the convoluted length of the border (L_b) made non-dimensional with respect to the length (L_m) of the temporally averaged flow field ($L_b/L_m = 2.8$) and ii) $\langle v_b^2\rangle/v_e^2 = 17$, as a measure of the sink-effect at the border. v_b is the measured velocity at the border; v_e is the well-established entrainment velocity far from the active shear layer whose value: $v_e/U_0 = 0.035$, corresponds to the growth of the self-preserving SSSL ($\mathrm{d}\theta/\mathrm{d}x$).

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