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Variation of the Karman Constant in a Highly Accelerated Turbulent Boundary Layer COREY BOURASSA, General Electric Research, FLINT THOMAS, University of Notre Dame — In this paper the response of an initially canonical turbulent boundary layer on a flat plate to the imposition of a favorable streamwise pressure gradient sufficient to cause relaminarization is investigated experimentally. In anticipation of the loss of standard log-law behavior, the local wall shear stress is measured directly using the oil film interferometry technique. It is shown that a logarithmic region is maintained even for the largest flow accelerations encountered in the experiment although the slope $1/\kappa$ and additive constant B exhibit a systematic streamwise variation from standard zero-pressure gradient values. The variation of the Karman and additive constants with applied pressure gradient is not explicitly associated with the relaminarization process. Systematic variation of the constants from their standard zero-pressure-gradient value occurs even for the comparably small favorable pressure gradient upstream of the contraction. This measured variation in $\kappa$and B is fully consistent with the empirical correlation proposed by Nagib & Chauhan (2008) for a wide variety of turbulent boundary layer experiments in favorable and adverse pressure gradients. However, the measurements obtained in this study extend the available data set to much larger values of $\kappa\, B$and B associated with strong favorable pressure gradients and relaminarization.

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