

Abstract Submitted
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Measurement of the Force Balance in Favorable Pressure Gradient Turbulent Boundary Layers¹ MEREDITH METZGER, ADAM LYONS, PAUL FIFE, University of Utah — Well resolved multi-sensor hot-wire measurements were obtained in a favorable pressure gradient turbulent boundary, generated by tilting the ceiling of a low speed wind tunnel at a constant angle of 1.3° . The experimental setup allowed direct measurement of all of the terms in the force balance as a function of wall-normal distance, streamwise location, and Karman number. The nature of the pressure gradient was such that the flow achieved equilibrium conditions at a streamwise location about three-quarters of the distance down the test section. Data from the present experiments are compared to available direct numerical simulations of the equilibrium case at much lower Reynolds number. Profiles of statistical quantities (mean, rms, Reynolds stress) as well as the ratio of terms in the force balance are analyzed for effects due to both non-equilibrium and acceleration parameter. Results are compared to theoretical predictions where appropriate.

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