

Abstract Submitted  
for the DFD10 Meeting of  
The American Physical Society

**Analytical solutions of a quasilaminarized turbulent boundary layer** RIKI MINORU HOPKINS, RAUL BAYOAN CAL, Portland State University — Analytical solutions to the characteristic equation, arising from similarity analysis as proposed by Cal and Castillo (2008),<sup>1</sup> describing a turbulent boundary layer subject to a strong favorable pressure gradient (FPG) approaching a quasilaminar state are found. By virtue of numerical analysis, solutions to this characteristic equation are obtained for several values of the pressure parameter,  $\Lambda = -\frac{\delta}{U_\infty} \frac{d\delta/dx}{dU_\infty/dx}$ , in addition to the Pohlhausen parameter,  $K_s = \frac{\delta^2}{\nu} \frac{dU_\infty}{dx}$ . These solutions characterize the influence of the two parameters on a turbulent boundary layer subject to a strong FPG, and quantify these parameters for such flows with eventual quasilaminarization. Different cases are tested to observe the limits of these parameters. The analytical solutions obtained are compared to the experimental data obtained by Warnack and Fernholz (1998).<sup>2</sup> A confirmation of the validity of this method and understanding of the influence of the remnants of the turbulence in the quasilaminar flow is assessed.

<sup>1</sup>R. B. Cal and L. Castillo (2008), Phys. Fluids. vol. 20, 105106.

<sup>2</sup>D. Warnack and H. H. Fernholz (1998), J. Fluid Mech. vol. 359, 357.

Raul Bayoan Cal  
Portland State University

Date submitted: 09 Aug 2010

Electronic form version 1.4