Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Characteristics of the Mean Momentum Balance in Turbulent Boundary Layers With Favorable Pressure Gradient[1] M. METZGER, A. LYONS, P. FIFE, University of Utah — The present study investigates the extent to which the layer structure of canonical wall flows, as observed by Wei et al. (2005) and Fife et al. (2005), becomes modified with the addition of a favorable pressure gradient. Experiments using an array of hot-wire probes were performed in a wind tunnel with a long development length. The pressure gradient was generated by tilting the ceiling at a constant angle. Well resolved hot-wire measurements are used to calculate the ratio of the terms in the mean momentum balance as a function of wall-normal distance, streamwise location, and Karman number. Data, from both the present experiments and available numerical simulations, are analyzed within the theoretical framework described by Metzger and Fife (submitted JFM), which predicts scaling properties based on a multiscale analysis of the mean momentum equation. Predictions from the theory, such as layer thicknesses, Reynolds stress decay, and peak Reynolds stress location, are evaluated using the aforementioned data.

[1]This work is supported by ONR (R. Joslin, grant monitor).

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Date submitted: 11 Aug 2005 Electronic form version 1.4