Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Pressure Fluctuations in Turbulent Wall Layers[1] RONALD PANTON, MYOUNGKYU LEE, ROBERT MOSER, University of Texas — Pressure fluctuation profile data from the channel flow DNS of Lee and Moser [*J. Fluid Mech.*, vol 774, 2015] extend to $Re_\tau \approx 5200$. In the outer region, with $Y = y/h$, the overlap layer pressure correlates very well by a log law; $\lim_{Y\to 0}\langle p^2\rangle^+ \sim (1/\eta)\ln Y + D_o$. The constant $\eta = -0.380$ is remarkable like the von Kármán value. In the inner region, the defect variable $\mathcal{P}(\dagger^+) \equiv \langle \surd^{\in}\rangle^+ - \langle \surd^{\in}\rangle^+|_{\dagger=\prime}$ absorbs the Re_τ dependence. The inner overlap equation is; $\lim_{y^+\to\infty}\mathcal{P} \sim (\infty/\eta)\ln\dagger^+ + \mathcal{D}_\rangle$. Together, the overlap laws imply that the wall pressure relation is $\langle p^2\rangle^+|_{y=0} \sim (-1/\eta)\ln Re_\tau + D_i - D_o$. A completely equivalent expression, which is finite as $Re_\tau \to \infty$, is obtained by rescaling the pressure variable; $\langle p^2\rangle^\#|_{y=0} \equiv (u_\tau/U_o)\langle p^2\rangle^+|_{y=0} = C_1 + C_2(u_\tau/U_o)$. Here, the constants are related to η, D_0, and D_i . Additionally, it was found that the wavenumber spectrum $E_{pp}\{k_x/h\}$ does not have a k^{-1} region. However, the trends do not rule out this at higher Re.

[1]This work was supported by NSF (OCI-0749223 and PRAC Grant 0832634), and computation resources were provided by the Argonne Leadership Computing Facility through the Early Science, INCITE 2013 and Directors Discretionary Programs.

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Date submitted: 15 Jul 2016 Electronic form version 1.4