Abstract Submitted
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On the scaling of velocity and vorticity variances in turbulent channel flow A. LEONARD, California Institute of Technology — The availability of new DNS-based statistics for turbulent channel flow (Lee & Moser, JFM 2015) along with previous results (e.g., Hoyas & Jiménez, Phys. Flu. 2006) has provided the opportunity for another look at the scaling laws for this flow. For example, data from the former (fig. 4(e)) for the streamwise velocity variance in the outer region clearly indicate a modified log law for that quantity at $Re_\tau = 5200$, i.e., $< u'^2 >^+ = C_0 - C_1 ln(y/\delta) - C_2 ln(y/\delta)^2$ where δ is the channel half height. We find that this result fits the the data very well for $0.1 < y/\delta < 0.8$. The Reynolds number (5200) is still apparently too low to observe the much-discussed log law (above with $C_2 = 0$), which, presumably, would appear for roughly $y/\delta < 0.1$, as it does in high Re_τ pipe flow (Hultmark et al., PRL 2012) with δ replaced by R. On the other hand, the above modified log law with the same values for C_1 and C_2 is a good fit for the pipe data at $Re_\tau = 98 \times 10^5$ for $y/R > 0.12$ (fig. 4 of Hultmark et al.).

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