Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Correlation of Fluctuating Vorticity in Turbulent Wall Layers
RONALD PANTON, University of Texas — It is commonly known that Reynolds shear stress $< uv >$ scales with the friction velocity u_*^2. On the other hand, Degraaff and Eaton (JFM, **422,** p 319) and Metzger and Klewicki (P of F, **13**, p 6 92) have shown that the streamwise Reynolds stress $<uu>$ scales more nearly as Uu_*. Townsend proposed that motions were "active" if they contributed to the Reynolds shear stress and "inactive" otherwise. Here, Townsend's definition is modified to say that motions are "active" if they scale with u_*; the same scaling as the Reynolds stress. A fluctuation that does not scale with u_* is "inactive." Vorticity profiles from the DNS (described in the various papers of Del Alamo, Jimenez, Zandonade, Moser, and Hoyas (P of F **15**, L-41; JFM, **500**,p135, P of F, **18**, 011702)) are reviewed. It is found that, in the limit of high Reynolds number, the outer region is free of vorticity. In the inner region the vortcity $<_{-y-y}>$ is active with no inactive component. The other components, $<_{-x-x}>$ and$<_{-z-z}>$, have active components that scale as $<_{---}$gvgo$u_*^4/_{-}{}^{y})$and inactive components that scale as $<_{---}$gvgoo$u_*/_{-}$p$^{y}u_*U$.Since at the wall the vorticity and shear stress are proportional, the wall stress fluctuations are found to be: $<_{-x\mathrm{w}}\mathrm{g}_{-x\mathrm{w}}> / \mathrm{o}_{-}{}^{y}u_*^3U) = 0.007$and $<_{-z\mathrm{w}}\mathrm{g}_{-z\mathrm{w}}> / \mathrm{o}_{-}{}^{y}u_*^3U) = 0.0038$.

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Date submitted: 24 Jul 2008 Electronic form version 1.4