Similarities between statistically-stationary homogeneous shear turbulence and the logarithmic layer in channels[1] SIWEI DONG, ATSUSHI SEKIMOTO, JAVIER JIMÉNEZ, Universidad Politécnica de Madrid — The rough independence of the logarithmic layer (LL) of wall-bounded turbulence from the details of the buffer and outer layers, suggests that the interaction of the turbulent fluctuations with the mean shear may be mimicked by statistically-stationary homogeneous shear turbulence(SS-HST) in a finite box. We study SS-HST in boxes for which the statistics best agree with those of the LL. Both flows share similar Corrsin shear parameters, and Reynolds-stress and vorticity anisotropies. Two-point correlation functions show that u and w are constrained by the simulation box and are respectively shorter and narrower for SS-HST than for the LL, but v and the vorticity are roughly of the same size in both flows when Re_λ is similar. The transient bursting of v in both flows is quite similar to the linear Orr mechanism, with time scales that are of the same order in both flows. In both cases, a streamwise velocity streak forms and breaks down quasi periodically, and the break down is accompanied by an enhanced flux of momentum, in the form of large-scale ejections and sweeps.

Siwei Dong
Universidad Politécnica de Madrid

Date submitted: 29 Jul 2013   Electronic form version 1.4