Asymptotic Sensitivity of Homogeneous Turbulent Shear Flow to the JUAN ISAZA, ZELLMAN WARHAFT, LANCE COLLINS, Cornell University — Our recent numerical studies of homogeneous turbulent shear flow suggest the dynamics of the large and small scales are sensitive to the initial value of the shear parameter. In particular for initial values of $S^* = Sk/\epsilon \geq 10$, we find that the asymptotic state of the turbulence depends upon this parameter. Rapid distortion theory (RDT) predicts the dependence of both large- and small-scale statistics on S^* reasonably well, but the theory is applicable only for relatively short times ($St < 2$). Direct numerical simulation (DNS) has a somewhat longer window, but it too eventually fails when the integral length scale becomes too large. Motivated by this earlier work, we performed experimental measurements of large- and small-scale velocity statistics in homogeneous turbulent shear flow in a wind tunnel. We are able to vary the initial shear parameter over the relevant range and observe the aforementioned asymptotic statistics. The experimental results will be presented, including detailed comparisons with earlier DNS and RDT.

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