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Effects of Inhomogeneity and Large Scale Intermittency on Small Scale Turbulence[1] DANIEL BLUM, GREG VOTH, Wesleyan University — We report on the effects of inhomogeneity and temporal fluctuations of energy injection on small scale turbulence statistics. We study a 1mx1mx1.5m flow between oscillating grids which produces Taylor Reynolds number 280 while containing regions of nearly homogeneous and highly inhomogeneous turbulence. Large data sets of 3D tracer particle velocities have been collected using stereoscopic high speed cameras with real-time image compression technology. The second and third order Eulerian structure functions are measured in both homogeneous and inhomogeneous regions of the flow. We condition the structure functions on the instantaneous large scale velocity or on the grid phase. At all scales, the structure functions depend strongly on the large scale velocity, but are independent of the grid phase. We see clear signatures of inhomogeneity, but even in the homogeneous region the dependence on the large scale velocity remains at all scales. Previous work has shown that similar correlations extend even to very high Reynolds numbers. Comprehensive measurements of these effects in a laboratory flow allows the possibility of separating the contributions from shear, inhomogeneity, and large scale intermittency.

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