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Two point correlations between velocity sums and differences in turbulence NICHOLAS ROTILE, GREG VOTH, SUSANTHA WIJESINGHE, Wesleyan University — In turbulent flows, the universality of small scales has been a subject of ongoing investigation. Recent work has explored the degree to which small scales are independent of large scales by measuring correlations between velocity differences over a distance r (whose variance is dominated by scales near r) and velocity sums over the same distance (whose variance is dominated by large scales). Some correlations between velocity differences and sums are required by the Navier-Stokes equations (Hosokawa, Prog. Theor. Phys. Lett., 118:169, 2007.) This talk will focus on experimental measurements of correlations between velocity sums and velocity differences in a turbulent flow between oscillating grids. We find that these correlations provide an accurate way to measure the energy dissipation rate that complements existing methods based on the third order structure functions. The correlations which are required by Navier-Stokes dynamics do not appear to violate the assumption of independence between the large and small scales, however there are other correlations in our measurements that show clear dependence of the small scales on the large scales.

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