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Turbulence at high resolution: intense events in dissipation, enstrophy and acceleration[1] P.K YEUNG, X.M. ZHAI, Georgia Tech, K.R. SREENIVASAN, New York Univ — Access to the *Blue Waters* supercomputer under the NSF Track 1 Petascale Resource Allocations program has allowed us to conduct an 8192^3 simulation of forced isotropic turbulence, with Taylor-scale Reynolds number close to 1300, and grid spacing at about 1.5 Kolmogorov scales. Extreme fluctuations in dissipation and enstrophy (over 10,000 times the mean) are observed, and found to scale similarly and occur together. Conditional sampling based on both dissipation and enstrophy shows that such extreme events in these variables are directly associated with strong intermittency in the fluid particle acceleration, which reaches values well beyond 100 standard deviations. An attempt is made to characterize in detail the formation of events of intense dissipation and enstrophy, including the transport, production and dissipation terms in the dissipation and enstrophy transport equations, as well as the nature of local flow conditions in principal strain-rate axes. Statistics of dissipation and enstrophy averaged over 3D sub-domains of linear size in the inertial range are also available. Both high Reynolds number and good small-scale resolution are important factors in these results.

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