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Pressure fluctuations and small-scale intermittency in DNS at high resolution[1] P.K. YEUNG, Georgia Tech, D.A. DONZIS, Texas A&M Univ., K.R. SREENIVASAN, ICTP, Italy — Pressure fluctuations in turbulence are closely related to local flow structure as well as (through the gradients) to the statistics of acceleration which is highly intermittent. We present results from direct numerical simulations of forced isotropic turbulence with 4096^3 grid points, and Taylor-scale Reynolds numbers (R_λ) up to about 1000. For sufficiently high Reynolds number a $k^{-7/3}$ inertial range develops in the pressure spectrum, consistent with experiments. Our present interest is to understand the nature of local flow conditions that correspond to the negative skewmess for the pressure PDF. In particular, conditional statistics show that low pressure is associated with more kinetic energy, larger enstrophy as well as dissipation, i.e. events of strong intermittency which also make accurate sampling of the negative tails of the pressure PDF difficult. By contrast, high pressure is associated with conditions of near-stagnation with strong strain rate but little vorticity. We also observe that the conditionally-averaged dissipation given the pressure also shows much stronger Reynolds number dependence than conditional enstrophy. This is consistent with recent work concerning comparisons between PDFs of dissipation and enstrophy.

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