Abstract Submitted
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The importance of 3D local averaging in turbulence theory: some examples from high-resolution DNS[1] PUI-KUEN YEUNG, X.M ZHAI, Georgia Tech, K.P. IYER, Univ of Rome Tor Vergata and INFN, Italy, K.R. SREENIVASAN, New York Univ — Dissipation fluctuations in turbulence become increasingly intermittent as the Reynolds number increases. Both theoretical and practical reasons then force us to consider the fluctuations averaged locally over three-dimensional (3D) volumes of various sizes. Often, the practice has been to supplant 3D averages by 1D averages, and to replace proper 3D quantities by convenient 1D surrogates. We examine the consequence of these practices using DNS data on a large grid of 8192^3 at a Taylor-microscale Reynolds number 1300. We show that these common practices can often lead to erroneous results and significant ambiguities. For instance, both the dissipation and enstrophy turn out to possess the same inertial-range intermittency exponent; moments of locally-averaged dissipation and enstrophy become closer to each other with increasing order (because extreme events in both are spatially co-located); the longitudinal and transverse velocity increments scale similarly—all in contrast to results obtained using the simplifying practices mentioned above.

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