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Anomalous scaling of passive scalar fluctuations in a spatially developing turbulent mixing layer ANTONIO ATTILI, FABRIZIO BISETTI, King Abdullah University of Science and Technology — A detailed statistical analysis of fluctuations of a passive scalar in the fully developed region of a spatially developing turbulent mixing layer from a direct numerical simulation is presented. Passive scalar spectra show inertial ranges characterized by scaling exponents $-4/3$ and $-3/2$ in the streamwise and spanwise directions, in agreement with recent theoretical analysis of passive scalar scaling in shear flows [Celani *et al.* J. Fluid Mech. 523, 99 (2005)]. Scaling exponents of high-order structure functions in the streamwise direction show saturation of intermittency with an asymptotic exponent $\zeta_\infty = 0.4$ at large orders. Saturation of intermittency is confirmed by the self-similarity of the tails of the probability density functions of the scalar increments at different scales r with the scaling factor $r^{-\zeta_\infty}$ and by the analysis of the cumulative probability of large fluctuations. Conversely, intermittency saturation is not observed for the spanwise increments, and the relative scaling exponents agree with recent results for homogeneous isotropic turbulence with mean scalar gradient. Probability density functions of the scalar increments in the three directions are compared to assess anisotropy.

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