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Comparative study of SGS scalar models for LES of turbulent mixing O.S. SUN, L.K. SU, Johns Hopkins University — For LES of applications involving scalar transport and mixing, the smallest scales of the molecular mixing process are unresolved, so understanding the effects of SGS modeling on the resulting concentration fields is particularly important. Comprehensive analyses of the range of modeling approaches for scalar transport and mixing have yet to be conducted. The present objective is to analyze the impact of different modeling approaches on the statistics of the resolved-scale scalar concentration. We perform LES of passive scalar mixing in a turbulent, round jet. The SGS scalar flux term in the scalar transport equation is closed using four different models, including: the dynamic eddy diffusivity and mixed models, the dynamic structure model (Chumakov, 2004) and the multi-fractal model (Burton, 2008). Results are analyzed by comparing mean concentration profiles and scaling, fluctuating quantities at the grid scale, scalar PDFs and spectra, and individual terms in the resolved-scale scalar transport equations. Particular attention is paid to the performance and behavior of SGS scalar models through analyses of model parameters, energy transfer, and structural fidelity.

O.S. Sun
Johns Hopkins University

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