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Subgrid-scale scalar diffusion in turbulent partially premixed flames[1] JIAN CAI, CHENNING TONG, Clemson University, ROBERT BARLOW, Sandia National Laboratories, ADONIOS KARPETIS, Texas A&M University — The conditionally filtered scalar diffusion used in large-eddy simulation of turbulent combustion is studied experimentally in the Sandia flames. One dimensional filter is implemented along line images to obtain filtered variables. For nearly fully burning samples the conditionally filtered diffusion for the mixture fraction and reactive scalars such as temperature and methane is consistent with the well mixed and highly nonpremixed SGS mixture fraction fields for small and large SGS scalar variances, respectively. Comparisons with IEM model predictions show that in addition to the inconsistency with the nonlinear functional form of the experimental results the model generally over-predicts the diffusion for small SGS variance but under-predicts it for large SGS variance, a result of the SGS mixing time scale used. For reactive scalars the use of their own SGS mixing time scales rather than the SGS mixture fraction time scale generally improve the magnitude of the prediction, suggesting that the current LES results can be improved by using reactive scalar time scales.

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