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Modeling Scalar variance from Direct Numerical Simulations of a turbulent mixing layer BAPTISTE RAVINEL, ENSTA ParisTech, GUILLAUME BLANQUART, California Institute of Technology — Many studies have focused on analyzing and predicting the mixing of a scalar such as fuel concentration in turbulent flows. However, the subfilter scalar variance in Large Eddy Simulations (LES) still requires additional considerations. The present work aims at obtaining results for the turbulent mixture of a scalar in configurations relevant to reactive flows, i.e. in the presence of mean velocity/scalar gradients. A Direct Numerical Simulation (DNS) of a turbulent mixing layer has been performed by initially combining two boundary layers. The high order conservative finite difference low Mach number NGA code was used together with the BQuick scheme for the transport of mixture fraction. The self-similar nature of the flow and energy spectra have been considered to analyze the turbulent flow field. High order velocity schemes (4th order) were found to play an important role in capturing accurately the mixing of fuel and air. The scalar variance has been calculated by filtering the solution and has been compared to various models usually used in LES. Following an earlier study by Balarac et al. [Phys. Fluids 20 (2008)], the concept of optimal estimators has been considered to identify the set of parameters most suitable to express the subfilter variance. Finally, the quality of the standard dynamic approach has been assessed.

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