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Implementation of the Velocity-Scalar Filtered Mass Density Function for Large Eddy Simulation of Turbulent Reacting Flows REZA SHEIKHI, PEYMAN GIVI, University of Pittsburgh, STEPHEN POPE, Cornell University — Our recently developed methodology "velocity-scalar filtered mass density function" (VSFMDF) is implemented for large eddy simulation (LES) of variable density, turbulent reacting flows. The VSFMDF represents the joint velocity-scalar probability density function of the subgrid scale quantities and is obtained by solving its modeled transport equation. In this equation, the effects of convection and chemical reaction appear in closed forms. The unclosed terms are modeled in a fashion similar to PDF methods [1]. This is the most general form of the filtered density function method for reacting flow simulations. The modeled VSFMDF transport equation is solved by a Lagrangian Monte Carlo method. The methodology is employed to simulate turbulent shear flows. The predicted results are assessed by comparisons with data generated by direct numerical simulation (DNS) and with experimental measurements. The VSFMDF results show a close agreement with DNS. The results also agree favorably with laboratory data and demonstrate several of the features observed experimentally.

[1] Pope, S. B., Turbulent flows, Cambridge University Press, Cambridge, UK (2000).

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