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Joint Frequency-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 — A new methodology, termed the frequency-velocity-scalar filtered mass density function (FVS-FMDF) is developed for large eddy simulation (LES) of turbulent reacting flows. The FVS-FMDF represents the joint frequency-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]. The modeled FVS-FMDF 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). The predictions are in good agreements with DNS data. The FVS-FMDF is the most comprehensive form of the FDF up to now.

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

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