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**Energy-Pressure-Velocity-Scalar Filtered Mass Density Function**
MEHDI B. NIK, PEYMAN GIVI, University of Pittsburgh, CYRUS MADNIA, University at Buffalo (SUNY), STEPHEN B. POPE, Cornell University — The "Energy-Pressure-Velocity-Scalar Filtered Mass Density Function" (EPVS-FMDF) is a new subgrid scale (SGS) model developed for large eddy simulation of high speed turbulent flows. This is an extension of the previously developed "velocity-scalar filtered mass density function" method [1] in low speed flows. In the EPVS-FMDF formulation, compressibility effects are accounted for by including two additional thermodynamic variables: the pressure and the internal energy. This is the most general form of the FDF for high speed flow simulations. The EPVS-FMDF is obtained by solving its transport equation, in which the effects of convection for velocity and scalar field appear in a closed form. The unclosed terms are modeled in a fashion similar to that in RANS-PDF methods. The modeled EPVS-FMDF transport equation is solved by a Lagrangian Monte Carlo method and is employed for LES of a temporally developing mixing layer at several values of the convective Mach number. The predicted results are assessed by comparison with direct numerical simulation (DNS) data.

[1] Sheikhi, M. R. H., Givi, P., and Pope, S. B., Velocity-Scalar Filtered Mass Density Function for Large Eddy Simulation of Turbulent Reacting Flows, Phys. Fluids, 19(9): 095196 1-21 (2007)

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