Pressure-Velocity-Scalar Filtered Mass Density Function for Large Eddy Simulation of Compressible Turbulent Flow ARASH NOURI GHEIMASSI, PEYMAN GIVI, University of Pittsburgh, MEHDI B. NIK, Stanford University, STEPHEN B. POPE, Cornell University — A new model is developed which accounts for the effects of subgrid scale pressure in the context of the filtered density function (FDF) formulation. This results in a pressure-velocity-scalar filtered mass density function (PVS-FMDF), which is suitable for large eddy simulation of compressible turbulence. Following its mathematical definition, an exact transport equation is derived for the PVS-FMDF. This equation is modeled in a probabilistic manner by a system of stochastic differential equations (SDEs). The consistency and the predictive capability of the model are established by conducting LES of a three-dimensional compressible mixing layer, and comparison with direct numerical simulation (DNS) data.

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