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Evaluation of Entropy Transport Equation in Turbulent Jet Flames using Filtered Density Function MEHDI SAFARI, Assistant Professor, REZA SHEIKHI, Professor — Evaluation of entropy provides a tool to optimize performance of combustion systems through the second law of thermodynamics. In turbulent reacting flows, entropy is generated due to viscous dissipation, heat conduction, mass diffusion and chemical reaction. In large eddy simulation (LES), all of these effects along with subgrid scale (SGS) entropy flux, appear as unclosed terms. The closure is provided by utilizing a special form of filtered density function (FDF) called entropy FDF (En-FDF). The prime advantage of using the En-FDF is that it provides closure for all individual entropy generation effects as well as scalar-entropy statistics. It also includes the effect of chemical reaction in a closed form. The En-FDF transport is modeled by a set of stochastic differential equations. The numerical solution procedure is based on a hybrid form of finite difference and Monte Carlo solvers in which the filtered transport equations are solved by the finite difference solver and the stochastic differential equations are solved by a Lagrangian Monte Carlo procedure. This methodology is applied to a turbulent nonpremixed jet flame and sources of irreversibilities are predicted and analyzed.

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