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Study of Entropy Generation in Turbulent Jet Flames Using Large Eddy Simulation MEHDI SAFARI, Miami University, REZA H. SHEIKHI, Northeastern University — Analysis of local entropy generation is an effective means to investigate sources of irreversibility in turbulent combustion. Large eddy simulation (LES) is employed to describe transport of entropy in turbulent reacting flows. The filtered form of this equation includes entropy production due to viscous dissipation, heat conduction, mass diffusion and chemical reaction, all of which appear as unclosed terms. The SGS effects are taken into account using a methodology based on the filtered density function (FDF). This methodology, entitled entropy FDF (En-FDF), is developed and utilized in the form of scalar-entropy FDF transport equation. This equation is modeled by a set of stochastic differential equations. The modeled En-FDF transport equation is solved by a Lagrangian Monte Carlo method. The methodology is employed for LES of a turbulent nonpremixed jet flame at several flow parameters. The main advantage of the En-FDF is that it provides closure for all individual entropy generation effects. It also includes the effect of chemical reaction in a closed form. Predictions show good agreements with the experimental data. Entropy generation effects are predicted by the En-FDF and analyzed. The sensitivity of entropy generation to flow parameters are investigated.

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