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Subfilter Modeling in Spray Combustion Using the Probability Density Function Approach COLIN HEYE, VENKAT RAMAN, The University of Texas at Austin — A probability density function (PDF) based approach for modeling spray combustion in the large eddy simulation (LES) context is used to study a series of experimental spray flames. Complex coupling of droplet dispersion, evaporation and scalar mixing in turbulent spray-laden flows results in a range of combustion regimes. Prior work has shown that variations in fuel inflow conditions can change the flame structure, however significant simplifications were made in these simulations with the use of steady laminar flamelet based models. In the joint-scalar PDF transport equation, the chemical source term appears closed, and in this work, in situ adaptive tabulation is effectively utilized to calculate component source terms allowing for the impact of finite rate kinetics to be analyzed. Further, the correlation between the evaporation source term and the subfilter scalar PDF is analyzed. Results from a priori direct numerical simulation (DNS) studies and LES calculations will be presented.

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