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LES-CMC Approach for Dilute Reacting Sprays SANTANU DE, BOXIONG CHEN, SEUNG HYUN KIM, Michigan Technological University — Large eddy simulation (LES) of dilute reacting spray jets is carried out using the conditional moment closure (CMC) method. Over the past few decades, LES-CMC has shown its capabilities in describing turbulence-chemistry interactions in gas-phase non-premixed reactive flows. In this study, we address some modeling complexities arising due to the presence of multiple phases. Most of the previous CMC studies have either neglected the effects of evaporation on conditional moments or used simplified models. Only recently, fundamental equations for the CMC modeling of spray combustion have been derived. The resulting CMC equations contain several correlation terms associated with phase changes. Here, an attempt is made to model those unclosed terms. A stochastic method is used to generate the SGS fluctuations in gas-phase reactive scalars consistent with the framework of a mixture-fraction-based combustion model. The SGS fluctuations of the gas-phase temperature and composition, seen by droplets, are used to refine the estimates of the interphase heat/mass transfer rates. Results from the LES-CMC approach for both the gas- and liquid phases are extensively validated against available experimental measurements.

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