Abstract Submitted
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An analysis of dispersion models in large eddy simulation of turbulent spray jet at low Stokes numbers[1] LORENZO ANGELILLI, King Abdullah University of Science and Technology, PIETRO PAOLO CIOTTOLI, RICCARDO MALPICA GALASSI, Sapienza, FRANCISCO HERNANDEZ-PEREZ, King Abdullah University of Science and Technology, MAURO VALORANI, Sapienza, HONG IM, King Abdullah University of Science and Technology — In the context of large eddy simulation (LES) of spray jets, many studies have been conducted on dispersion models to accurately reconstruct the gas velocity at the droplet position, which is needed by the momentum forcing term. A proper dispersion model must hold the particles inside their vapor region, preventing excessive evaporation and unrealistic autoignition events in hot environments. Two main approaches are available in the literature: Langevin-type equation model that suffers from excess of induced momentum for low Stokes number, and approximate deconvolution method (ADM) that performs well mostly in the aforementioned regime. Accordingly, a model that combines a Langevin-type equation and ADM is presented and its performance is examined. This study focuses on the sensitivity to the dispersion model of global quantities, such as mean velocity field and mixture fraction, which is lower than that of local quantities, such as particle distribution and preferential segregation. LES results with different dispersion models are compared to DNS results. The analysis will include averages conditioned on the mixture fraction for enstrophy of particle number, droplet diameter, and mass and energy source terms.

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