Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Experimentally-guided inflow conditions for Euler-Lagrange Large Eddy Simulations of Mid-field Spray[1] KAI LIU, University of Florida, PETER HUCK, ALBERTO ALISEDA, University of Washington, SIVARAMAKRISHNAN BALACHANDAR[2], University of Florida — The coaxial round jet sprays are common in a variety of engineering applications. The spray is commonly analyzed separately as two parts, a surface tension dominated near-field where the intact liquid ejected from the nozzle deforms and atomizes, and a fully-disperse mid-field where the liquid phase has already broken into tiny droplets that continue to drift as a polydisperse distribution of droplets. The mid-field spray can be efficiently simulated by the Euler-Lagrange approach. However, how to model the inflow condition of the droplets is of great difficulty. Based on companion experimental measurements, this work has rigorously analyzed the droplet position, diameter and velocity statistics, as well as their correlations, and accordingly developed a high-fidelity stochastic injection model for use in the Euler-Lagrange simulations. The gas phase at Reynolds number 50000 is solved by two-way coupled large eddy simulations and validated against experimental measurements from the first to the third order turbulent statistics. When injected according to the injection model, the two-phase simulation results yield consistent time-averaged results with the experimental data gathered at downstream locations.

[1]Supported by the Office of Naval Research (ONR) as part of the MURI Program, under grant number N00014-16-1-2617.
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Date submitted: 28 Jul 2020 Electronic form version 1.4