Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

High Fidelity Simulation of Primary Atomization in Diesel Engine Sprays[1] CHRISTOPHER IVEY, Stanford University, LUIS BRAVO, U.S. Army Research Laboratory, DOKYUN KIM, Cascade Technologies — A high-fidelity numerical simulation of jet breakup and spray formation from a complex diesel fuel injector at ambient conditions has been performed. A full understanding of the primary atomization process in fuel injection of diesel has not been achieved for several reasons including the difficulties accessing the optically dense region. Due to the recent advances in numerical methods and computing resources, high fidelity simulations of atomizing flows are becoming available to provide new insights of the process. In the present study, an unstructured un-split Volume-of-Fluid (VoF) method coupled to a stochastic Lagrangian spray model is employed to simulate the atomization process. A common rail fuel injector is simulated by using a nozzle geometry available through the Engine Combustion Network. The working conditions correspond to a single orifice (90 μm) JP-8 fueled injector operating at an injection pressure of 90 bar, ambient condition at 29 bar, 300K filled with 100% nitrogen with $Re_l = 16{,}071$, $We_l = 75{,}334$ setting the spray in the full atomization mode. The experimental dataset from Army Research Lab is used for validation in terms of spray global parameters and local droplet distributions. The quantitative comparison will be presented and discussed.

[1]Supported by Oak Ridge Associated Universities and the Army Research Laboratory

Dokyun Kim
Cascade Technologies, Inc

Date submitted: 02 Aug 2014 Electronic form version 1.4