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Atomization of a High Speed Jet ZHILIANG XU, MYOUNGNYOUN KIM, WONHO OH, JAMES GLIMM, Applied Math Dept. SUNY at Stony Brook, ROMAN SAMULYAK, Brookhaven National Laboratory, XIAOLIN LI, Applied Math Dept. SUNY at Stony Brook, CONSTANTINE TZANOS, Argonne National Laboratory — We present a numerical study of the jet breakup and spray formation in a diesel engine by the Front Tracking method. The mechanisms of jet breakup and spray formation of a high speed diesel jet injected through a circular nozzle are the key to design a fuel efficient, nonpolluting diesel engine. Many parameters such as the nuzzle shape, the velocity and the turbulence of the jet and the thermodynamic states of liquid and gas could be contributing causes for jet breakup. We conduct the simulations for the jet breakup within a 2D axis-symmetric geometry. Our goal is to model the spray at a micro-physical level, with the creation of individual droplets. The problem is multiscale. The droplets are a few microns in size. The nozzle is about 0.2 mm in diameter and 1 mm in length. In order to resolve various physical patterns such as vortex, shock waves, vacuum and track droplets and spray, the Burger-Colella adaptive mesh refinement technique is used. We model mixed vapor-liquid region through a heterogeneous model with dynamic vapor bubble insertion. On the liquid/vapor interface, a phase transition problem is solved numerically.

Zhiliang Xu
Brookhaven National Laboratory

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