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Detailed Numerical Simulations of the Primary Atomization of a Turbulent Liquid Jet in Crossflow[1] MARCUS HERRMANN, Arizona State University — Atomizing liquids by injecting them into crossflows is a common approach to generate fuel sprays in gas turbines and augmentors. While correlations derived from experimental data exist for the jet penetration, predicting the drop size distribution resulting from the primary breakup of the liquid jet is a more challenging task. This is in part due to the fact that often, several different atomization mechanisms occur on the jet's surface at the same time. Detailed numerical simulations can help study the simultaneously occurring mechanisms, even in regions of the liquid jet, where traditional experimental methods cannot observe the phase interface dynamics. To handle the large range of time and length scales that occur during atomization, we employ the Refined Level Set Grid (RLSG) method, coupled to a finite volume, balanced force, incompressible LES flow solver. We will present results for a momentum flux ratio 6.6 turbulent liquid jet of Weber number 330 and Reynolds number 14,000 injected into a gaseous crossflow of Reynolds number 740,000, taking the detailed geometry of the injector into account. The physical mechanisms causing the initial breakup of the jet, the resulting grid dependent/independent drop size distributions, and the jet penetration will be discussed.

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