Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Simulating Primary Atomization of a Liquid Jet in a Supersonic Crossflow[1] KARTHIK KANNAN, Arizona State University, FABIAN FRITZ, Technical University of Munich, CARLOS BALLESTEROS, Arizona State University, NICO FLEISCHMANN, Technical University of Munich, MARCUS HERRMANN, Arizona State University — Numerical simulations can provide valuable insight to understanding the atomization process of fuel within the combustor of a scramjet engine. A high-fidelity extension to a diffuse-interface approach for simulating compressible multiphase flows (Garrick et al., 2017) was recently developed (Fritz et al., 2019) targeting the accurate simulation of primary atomization. To this end, a novel, unstructured, cell-based adaptive mesh refinement (AMR) framework (Ballesteros, 2019) is used to achieve higher mesh resolution in regions of liquid and shock discontinuities. Furthermore, low dissipation, high spatial accuracy is obtained by using a WENO-Z (Borges et al., 2008) reconstruction, while the numerical smearing of the material interface is controlled using a THINC reconstruction scheme (Shyue and Xiao, 2014). Curvature is computed using a stretched variant of the standard height function method (Cummins et al., 2005) to account for the smearing of the material interface. Simulations of liquid jet in supersonic crossflow are performed to study the jet penetration height, droplet size and velocities in the near field of the injected plume.

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Date submitted: 03 Aug 2020 Electronic form version 1.4