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Detailed simulation of atomizing liquid jets using a Spectrally Refined Interface (SRI) approach HEINZ PITSCH, Department of Mechanical Engineering, Stanford University, OLIVIER DESJARDINS, Department of Mechanical Engineering, University of Colorado at Boulder — Simulating primary atomization remains an outstanding challenge due to the presence of turbulence, small scale liquid structures, and singular surface tension forces. A new approach is presented that employs sub-cell quadrature nodes to provide a high order polynomial reconstruction of a level set function. This Spectrally Refined Interface (SRI) description is coupled to semi-Lagrangian transport to alleviate the small time step requirements usually associated with local refinement, and is combined with the Ghost Fluid Method (GFM) to accurately and robustly handle the discontinuous material properties in the two phases, as well as surface tension forces. This technique is validated over a range of test cases and is shown to provide a very accurate description of the interface even at the limit of numerical resolution. Highly detailed simulations of atomizing two-phase jets are conducted, and the physical processes occurring during atomization are discussed.

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