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**Simulating Primary Atomization at Arbitrary Density Ratios: a Stable and Conservative Framework** VINCENT LE CHENADEC, Stanford University, HEINZ PITSCH, Institute for Combustion Technology, RWTH Aachen — The present work focuses on two recent developments for Direct Numerical Simulation of two-phase flows, and their application to computations of turbulent primary atomization of liquid jets at large density ratios. Mass conservation properties of the algorithm are improved by means of a second-order unsplit Volume-of-Fluid method coupled to the Level Set approach. The three-dimensional volume fraction transport scheme is shown to reduce numerical artifacts known to pollute the interface representation in under-resolved regions of the flow. In the interface vicinity, the momentum conservation as well as stability of the flow solver are guaranteed by a monotonicity preserving geometric transport of the momentum, defined consistently with the volume fraction transport. Away from the interface, the flux computation is switched to a centered discretization in order to avoid excessive numerical dissipation. This framework is assessed in a set of validation cases, and applied to simulate the primary atomization of a turbulent round jet in quiescent gas at air/water density ratio and moderate Reynolds and Weber numbers.

Vincent Le Chenadec
Center for Turbulence Research, Stanford University

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