Numerical simulation of air-blast atomization of a liquid layer G.
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University — Numerical simulations of a planar co-flowing air/water airblast atom-
ization is performed using an in-house multiphase Navier-Stokes solver based on a
semi-lagrangian geometric Volume of Fluid (VOF) method to track the position of
the interface. This solver conserves mass and momentum exactly within each phase.
Excellent agreement with recent experiments is obtained when comparing physical
quantities, such as the liquid cone length, the maximum wave frequency and the
spatial growth rate of the primary instability. A full three dimensional simulation
is used to analyze the turbulence in the gas phase. The gas layer is laminar close to
the injector and becomes turbulent at downstream positions. The transition to the
turbulence is shown to increase first as an exponential function of the downstream
positions and then reach a statistically stable regime where the liquid wave crests
expand in a thin sheet which breaks into secondary droplets.

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