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Multiphase cryogenic hydrogen fet flow: a numerical study

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This research presents a numerical investigation into the multiphase behaviour of cryogenic hydrogen gas jets released into ambient air, with particular attention to the liquefaction of atmospheric water vapour induced by strong shear. The simulations are conducted using a computational fluid dynamics (CFD) solver developed within a finite volume framework, incorporating a hybrid Noble-Abel Stiffened Gas (NASG) equation of state to model multiphase thermodynamics. The study focuses on the effects of ambient humidity, which influences the amount of water vapour that condenses into liquid water, on the unsteady flow structures. Results reveal that accounting for the transient phase-change processes significantly alters vortex dynamics in the turbulent jet, thereby affecting hydrogen dispersion and multiphase mixing in the surrounding air.

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