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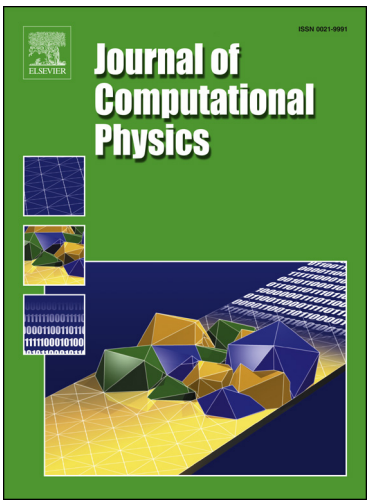

A computational framework for interface-resolved DNS of simultaneous atomization, evaporation and combustion

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Highlights

- A computational framework for interface-resolved direct numerical simulation (DNS) of simultaneous atomization, evaporation and combustion process is proposed.
- The present work utilizes level set method to implicitly capture the gas-liquid interface and Ghost Fluid Method (GFM) to accurately address jump conditions across the interface.
- Level set method with sub-cell resolution of the interface is employed and a semi-Lagrangian scheme for the discretization of level set equation with evaporation source term are proposed.
- To the best of our knowledge, this is the first computational framework that could simulate spray combustion with interface-resolved method.
- The present framework has been validated by several cases, such as, evaporation rate, wet bulb temperature comparison, the Stefan problem, the sucking problem, evaporation of static and moving droplet, and combustion of static and moving droplet. Finally, integrated simulation of droplet collision and combustion is performed to evaluate the accuracy and robustness of the present method.