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# Investigation of a Single Droplet Impact onto a Liquid Film with Given Horizontal Velocity

Chen Liu<sup>2</sup>, Meng Shen<sup>2</sup> and Jie Wu<sup>1,2\*</sup>

1. State Key Laboratory of Mechanics and Control of Mechanical Structures,

Nanjing University of Aeronautics and Astronautics,

Yudao Street 29, Nanjing, Jiangsu 210016, China

2. Department of Aerodynamics, Nanjing University of Aeronautics and Astronautics,

Yudao Street 29, Nanjing, Jiangsu 210016, China

## Abstract

The dynamics of a single droplet impact onto a liquid film is numerically studied in this work. A two-dimensional droplet is initially placed above a liquid film and falls freely under gravity together with a given horizontal velocity. To conduct numerical simulations, a hybrid method is adopted, in which the flow field is solved by using the lattice Boltzmann method and the interface is captured by solving the Cahn-Hilliard equation directly. At a fixed value of density ratio of droplet to ambient fluid ( $\rho^*$ ), the effects of Bond number (Bo), Weber number (We) and dimensionless liquid film thickness ( $H^*$ ) are systematically investigated. Based on the results achieved, it is found that the behavior of resultant splash structure after droplet impact is greatly affected by Bo, We and  $H^*$ . By increasing Bo and We, a higher right jet can be generated, but it has an opposite influence on the left jet. Moreover, there exists a

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\* Corresponding author; Email: [wuj@nuaa.edu.cn](mailto:wuj@nuaa.edu.cn).

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