3D Numerical Simulation of Droplet Impingement with Splash

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Purpose

Investigate the effect of surface wettability and high ambient pressure on the outcome of droplets impinging on dry surfaces with detailed 3D numerical simulations.

Outline

Droplet impingements with various conditions are simulated with in-house code FK^{3} (1).

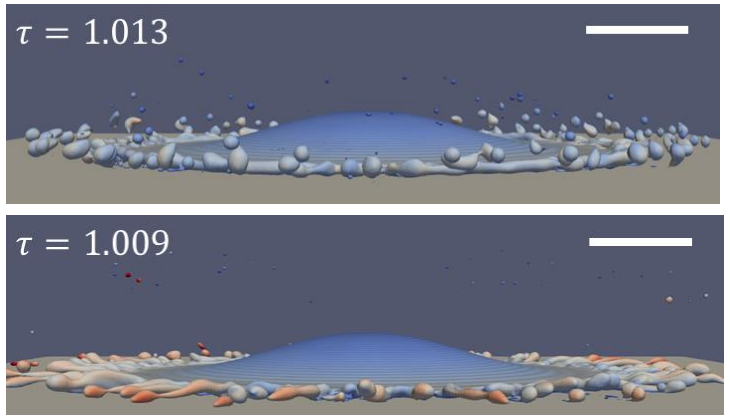
Result

Wettability influences the outcome of droplet impingement at the initial stage (i.e., when the droplet initially touches down on the surface and generates a thin film from the three-phase contact line) by triggering a larger average velocity magnitude in the generated thin film, together with a stronger variation on the azimuthal velocity distribution generated by the impingement immediately after the touchdown onto the surface.

Ambient pressure significantly prompts the splash during the spreading of droplets on the surface after the impingement. A vortex above the tip of the droplet is observed in the investigation. The generation and extension of filaments after the impingement, which is usually referred to as fingering for its shape, is significantly suppressed under high ambient pressure.

Computing system: SQUID General Purpose CPU nodes

case performed	12 cases
storage used	1.5TB/case
parallelize	53 nodes (4000 Cores)



Splashing droplets under different ambient pressure in simulations

(1) http://www.tse.me.kyoto-u.ac.jp/members/kurose/link.php