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Simulation of High-Speed Droplet Impact Against Dry Substrates with Partial Velocity Slip[1] TOMOKI KONDO, KEITA ANDO, Department of Mechanical Engineering, Keio University — High-speed droplet impact can be used to clean substrates such as silicon wafers. Radially spreading shear flow after the impact may allow for mechanically removing contaminant particles at substrate surfaces. Since it is a big challenge to experimentally explore such complicated flow that exhibits contact line motion and water hammer, its flow feature is not well understood. Here, we aim to numerically evaluate shear flow caused by the impact of a spherical water droplet (of submillimeter sizes) at high speed (up to 50 m/s) against a dry rigid wall. We model the flow based on compressible Navier-Stokes equations with Stokes' hypothesis and solve them by a high-order-accurate finite volume method equipped with shock and interface capturing. To treat the motion of a contact line between the three phases (the droplet, the rigid wall, and the ambient air) in a robust manner, we permit velocity slip at the wall with Navier's model, for wall slip is known to come into play under steep velocity gradients that can arise from high-speed droplet impact. In our presentation, we will examine radially spreading flow after the droplet impact and the resulting wall shear stress generation from the simulation.

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