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Surface impingement of high-speed micron-sized diesel drop trains: splashing characteristics and secondary droplets[1] DAVID MARKT JR., MEHDI RAESSI, University of Massachusetts Dartmouth, SEONG-YOUNG LEE, XIUCHENG ZHU, Michigan Technological University — This work investigates surface impingement of high-speed micron-sized diesel drop trains using computational simulations. The drop trains serve as a simplified analog to approximate fuel sprays. The drop size and impact velocity represent engine-relevant fuel injection conditions. The 3D simulations include impingements onto initially dry and wetted stainless steel substrates, where the effects of impingement frequency were quantified. The transition from depositing to splashing was identified and the effects of pre-existing film thickness were investigated. Using a robust algorithm, secondary droplet characterization was performed on simulation results to obtain distributions of secondary droplet size, velocity and trajectory angle. The results were compared to spray-wall interaction (SWI) sub-models commonly used in Lagrangian-Eulerian solvers. The comparison reveals the SWI sub-models suffer from significant inaccuracy under engine-relevant conditions, highlighting the need for further study of high-speed micron-sized fuel drop impingement.

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