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On Splashing Dynamics of Diesel Drop Trains Under Engine-Relevant Impingement Conditions: a Computational Study[1] DAVID MARKT JR., ASHISH PATHAK, MEHDI RAESSI, University of Massachusetts Dartmouth, ROBERTO TORELLI, Argonne National Laboratory, SEONG-YOUNG LEE, Michigan Technological University — In this study, advanced 3D simulations of micron-sized diesel drop trains impinging on a solid substrate are presented. The droplet size and impact velocity are representative of the impingement conditions during fuel injection in internal combustion engines. Generally, diesel fuel injection is studied using Lagrangian-Eulerian solvers which rely on spray-wall interaction sub-models to predict the drop impingement outcomes. We have found such sub-models may predict inaccurate splashing outcomes under such extreme impingement conditions. Therefore, using drop trains as an idealized spray, highly-resolved simulations are presented and quantities such as the splashed mass ratio and secondary droplet distribution are compared to common spray-wall interaction sub-models. The effects of liquid film thickness, contact angle and ambient gas pressure on the splashing dynamics are also quantified. By varying the impingement conditions, a robust analysis is presented highlighting the dominant parameters which affect splashing.

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