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Computational Study of Droplet Trains Impacting a Smooth Solid Surface[1] DAVID MARKT JR, ASHISH PATHAK, MEHDI RAESSI, Univ of Mass - Dartmouth, SEONG-YOUNG LEE, EMMA ZHAO, Michigan Technological University — The study of droplet impingement is vital to understanding the fluid dynamics of fuel injection in modern internal combustion engines. One widely accepted model was proposed by Yarin and Weiss (JFM, 1995), developed from experiments of single trains of ethanol droplets impacting a substrate. The model predicts the onset of splashing and the mass ejected upon splashing. In this study, using an in-house 3D multiphase flow solver, the experiments of Yarin and Weiss were computationally simulated. The experimentally observed splashing threshold was captured by the simulations, thus validating the solver's ability to accurately simulate the splashing dynamics. Then, we performed simulations of cases with multiple droplet trains, which have high relevance to dense fuel sprays, where droplets impact within the spreading diameters of their neighboring droplets, leading to changes in splashing dynamics due to interactions of spreading films. For both single and multi-train simulations the amount of splashed mass was calculated as a function of time, allowing a quantitative comparison between the two cases. Furthermore, using a passive scalar the amount of splashed mass per impinging droplet was also calculated.

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