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Thermal Boundary Layer Dynamics in Multiple Droplet Impingement[1] MARIO F. TRUJILLO, STEVEN LEWIS, EELCO GEHRING, University of Wisconsin — The impingement of a stream of HFE-7100 droplets striking a pre-wetted and heated surface is studied for droplet Weber and Reynolds numbers ranging from 285 to 427 and 1250 to 4850, respectively, and for a film depth to droplet diameter ratio varying from 0.4 to 1.5. After a short period, a quasi-steady state is achieved; in which the liquid crown formed during continuous droplet impact remains nearly stationary. Temporal averages of the velocity, temperature, and liquid fraction fields suggest that the boundary layer can be categorized as consisting of a stagnation point flow region, a linear growth section, and a jump region, similar to a hydraulic jump, near the liquid crown. Results of the average radial temperatures are compared to experiments for various heat fluxes yielding good agreement. Additionally, it is shown that a sub-layer is present in all cases considered, which is categorized by low values of the local Peclet and Reynolds numbers. The heat transfer mode in this sub-layer domain is governed to a great degree by conduction, and experiences a delayed cooling effect.

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