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A Laboratory Study of a Water Surface in Response to Rainfall
REN LIU, XINAN LIU, JAMES DUNCAN, Department of Mechanical Engineering, University of Maryland, College Park — The shape of a water surface in response to the impact of raindrops is studied experimentally in a 1.22-m-by-1.22-m water pool with a water depth of 0.3 m. Simulated raindrops are generated by an array of 22-gauge hypodermic needles that are attached to the bottom of an open-surface water tank. The tank is connected to a 2D translation stage to provide a small-radius horizontal circular or oval motion to the needles, thus avoiding repeated drop impacts at the same location under each needle. The drop diameter is about 2.6 mm and the height of the water tank above the water surface of the pool is varied from 1 m to 4.8 m to provide different impact velocities. The water surface features including stalks, crowns and ring waves are measured with a cinematic laser-induced-fluorescence (LIF) technique. It is found that the average stalk height is strongly correlated to the impact velocities of raindrops and the phase speeds of ring waves inside the rain field are different from that measured outside the rain field.

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