

Abstract Submitted
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Free-fall of Water Drops Generated in the Laboratory for Rainfall Simulations¹ FIRAT TESTIK, NASIM CHOWDHURY, MATHEW HORNACK, ABDUL KHAN, Glenn Department of Civil Engineering, Clemson University, Clemson, SC — The shape and fall velocity evolution of water drops that are falling freely were studied using high-speed imaging. Digital image processing techniques were utilized to measure drop characteristics. Water drops of three target diameters were generated using needles placed at 12 different stations (approximately 1 m apart vertically for a fall distance of 12 m) of a stairwell and sequential high-speed drop images were obtained at the bottom floor. Our experimental observations indicated that generated drops underwent three distinct regions during free-fall. The first region, where different oscillation modes prevail, is influenced by the source conditions. The drop oscillations are absent in the second region and the shapes of the drops transition towards equilibrium shapes. Through the third region, the drops experience free-fall at equilibrium shapes and terminal velocities and possess characteristics similar to those of raindrops in an actual rain event. The ranges of the different fall regions were delineated based upon our experimental observations. The results of this study are useful in (i) determining the fall distance required for laboratory simulation of rainfall and (ii) studying the shape - fall velocity coupling of raindrops in the laboratory.

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