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Spray formation during the vertical impact of a flat plate on a quiescent water surface[1] AN WANG, JAMES H. DUNCAN, Univ of Maryland-College Park — Spay formation during the impact of a rigid flat plate (122 cm by 38 cm) on a quiescent water surface is studied experimentally. The plate is mounted on a carriage that is driven by an electric servo motor that can slam the plate vertically into the water surface under feedback-controlled motions at various speeds. The long edges of the plate are kept horizontal and the short edges are set at various angles (roll angles) with respect to the quiescent water surface. A laser light sheet is created in a vertical plane at the middle of the long edges of the plate. The evolution of the spray within the light sheet is measured with a cinematic laser induced fluorescence technique. Two types of spray are found with nonzero roll angles. The first type is a cloud of high-speed droplets and ligaments that are generated when the plate's leading edge impacts the free surface. The second type is a thin water sheet that is connected to the trailing edge of the plate via a crater and is formed after the trailing edge moves below the local water level. In a reference frame moving with the plate, the profiles of the crater collapse when scaled with a power law function of time. The characteristics of the two types of spray are found to be affected by both the roll angle and the impact velocity.

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An Wang
Univ of Maryland-College Park

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