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Vortices catapult droplets in atomization J. JOHN SOUNDAR JEROME, Institut D'Alembert (IJLRDA), CNRS - UPMC, France, SYLVAIN MARTY, JEAN-PHILIPPE MATAS, Laboratoire des Écoulements Géophysique et Industriels (LEGI), CNRS - Université de Grenoble, France, STEPHANE ZALESKI, JEROME HOEPFFNER, Institut D'Alembert (IJLRDA), CNRS - UPMC, France — A droplet ejection mechanism in planar two-phase mixing layers is examined. Any disturbance on the gas-liquid interface grows into a Kelvin-Helmholtz wave and the wave crest forms a thin liquid film that flaps as the wave grows downstream. Increasing the gas speed, it is observed that the film breaks-up into droplets which are eventually thrown into the gas stream at large angles. In a flow where most of the momentum is in the horizontal direction, it is surprising to observe these large ejection angles. Our experiments and simulations show that a recirculation region grows downstream of the wave and leads to vortex shedding similar to the wake of a backward-facing step. The ejection mechanism results from the interaction between the liquid film and the vortex shedding sequence: a recirculation zone appears in the wake of the wave and a liquid film emerges from the wave crest; the recirculation region detaches into a vortex and the gas flow over the wave momentarily reattaches due to the departure of the vortex; this reattached flow pushes the liquid film down; by now, a new recirculation vortex is being created in the wake of the wave–just where the liquid film is now located; the liquid film is blown-up from below by the newly formed recirculation vortex in a manner similar to a bag-breakup event.

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