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Numerical investigation of air film breakup and micro-bubble formation in liquid-liquid impact events[1] SEYEDSHAHABADDIN MIRJALILI, ALI MANI, Stanford University — Experimental evidence shows that micro-bubbles can be generated when a droplet of the size of a few millimeters impacts a layer of the same liquid with a velocity of a few meters per second. This phenomenon, also known as Mesler entrainment is cumbersome to numerically simulate due to the small time and length scales involved. In order to gain a better understanding of the relevant scales, parameters, and regions, 2-D boundary element simulations inspired by M. Mani, Mandre, Brenner (JFM, vol. 647, p. 143, 2010) were performed. By developing treatments for topological changes, these simulations are extended to after impact events and finally depict the formation of micro-bubbles of sizes similar to entrapped bubbles in Mesler entrainment. Compressibility effects on final bubble size are discussed, and the requirements for a resolved CFD calculation are obtained. Thereafter, a 2-D two-phase flow calculation using a diffuse interface model is undertaken and based on grid-converged results, the statistics of the bubbles are examined and compared with available experimental data.

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Seyedshahabaddin Mirjalili
Stanford University

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