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Emergence of Superwalkers[1] RAHIL VALANI, School of Physics and Astronomy, Monash University, Victoria 3800, Australia, TAPIO SIMULA, Optical Sciences Centre, Swinburne University of Technology, Melbourne 3122, Australia, ANJA SLIM, School of Mathematics, Monash University, Victoria 3800, Australia
— Superwalking droplets emerge when a bath of silicone oil is vibrated simultaneously at a given frequency and its subharmonic tone with a relative phase difference between them. To understand the emergence of superwalking droplets, we have explored their dynamics numerically by extending previously established theoretical models for walkers driven by a single frequency to superwalkers driven by two frequencies. We show that driving the bath at two frequencies with an appropriate phase difference raises every second peak and lowers the intermediate peaks in the vertical periodic motion of the fluid surface. This allows large droplets that could otherwise not walk to leap over the intermediate peaks, resulting in superwalkers. We find that the droplet's vertical and horizontal dynamics are strongly influenced by the relative height difference between successive peaks of the bath motion, a parameter that is controlled by the phase difference. Comparison of our simulated superwalkers with experiments shows good agreement for small- to moderate-sized superwalkers. A novel behavior of superwalking droplets, the stop-and-go motion, is also captured in our simulations.

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