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Slowing down bubbles with sound CEDRIC POULAIN, Commissariat à l'Energie Atomique, France, REMIE DANGLA, Ecole Polytechnique, France, MARION GUINARD, Ecole Centrale Paris, France — We present experimental evidence that a bubble moving in a fluid in which a well-chosen acoustic noise is superimposed can be significantly slowed down even for moderate acoustic pressure. Through mean velocity measurements, we show that a condition for this effect to occur is for the acoustic noise spectrum to match or overlap the bubble's fundamental resonant mode. We render the bubble's oscillations and translational movements using high speed video. We show that radial oscillations (Rayleigh-Plesset type) have no effect on the mean velocity, while above a critical pressure, a parametric type instability (Faraday waves) is triggered and gives rise to nonlinear surface oscillations. We evidence that these surface waves are subharmonic and responsible for the bubble's drag increase. When the acoustic intensity is increased, Faraday modes interact and the strongly nonlinear oscillations behave randomly, leading to a random behavior of the bubble's trajectory and consequently to a higher slow down. Our observations may suggest new strategies for bubbly flow control, or two-phase microfluidic devices. It might also be applicable to other elastic objects, such as globules, cells or vesicles, for medical applications such as elasticity-based sorting.

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