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Direct Numerical Simulation of weakly nonlinear bubble oscillations[1] YUZHE FAN, HAISEN LI, Acoustic Science and Technology Laboratory, Harbin Engineering University, Harbin 150001, China, DANIEL FUSTER, Sorbonne Universit, Centre National de la Recherche Scientifique, UMR 7190, Institut Jean Le Rond DAlembert, F-75005 Paris, France — Bubble dynamics have been studied extensively during the last century. Because of the highly nonlinear nature, the oscillations of gas bubbles in a liquid are of great practical interest and relevant in diverse technologies. Traditionally, to study stably oscillating micro-bubbles subjected to ultrasound or megasound, Rayleigh-Plesset (R-P) type equations assuming spherical symmetry are frequently chosen. However, although the bubble can oscillate without breaking in such weakly nonlinear oscillation regimes, non-spherical effects neglected in RP models will become increasingly important with the increasing of the amplitude of pressure pulse and the frequency of the incident wave. To investigate such non-spherical mechanisms, we present simulations of the interaction between a traveling acoustic wave and a single bubble using Direct Numerical Simulations (DNS) [Fuster and Popinet. (2018). J. Comput. Phys. 374, 752-768]. Depending on the pressure waves emitted by the moving non-spherical bubble, we characterize different weakly nonlinear oscillation regimes as a function of the Reynolds, Weber and the amplitude of incident pressure. The comparison between DNS and R-P type equations is also done to quantitatively estimate the range of applicability of simplified models.

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