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The low-frequency resonance of acoustic scattering at bubble clouds*

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Abstract

When air bubbles in water are excited by a low-frequency acoustic signal, they exhibit resonant behaviour. This has a strong impact on the accuracy of underwater sonar surveillance systems, which typically operate at frequencies close to the resonance mode of fish with swim bladders. Even though the resonance of a single air bubble can be calculated analytically, computational methods have to be used when considering a cloud of bubbles. In the case of bubbles situated close to each other, the standard techniques based on low-frequency approximations fail to predict the pronounced frequency shift accurately. In this study, a boundary integral equation of the transmission problem is being discretized with the multi-trace formulation. The numerical results show an accurate simulation of the low-frequency behaviour of different bubble cloud configurations.

Key words: acoustics, resonance, boundary integral equation

Mathematics subject classifications (1991): 65R20, 78A45

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