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AN EULERIAN-LAGRANGIAN STUDY OF CLOUD DYNAMICS NEAR A WALL

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The dynamics of bubble clouds is studied using an Eulerian-Lagrangian model treating the two-phase medium as a continuum and modeling the microbubbles as discrete sources and dipoles tracked in a Lagrangian fashion. These two are coupled through the local void fractions associated with the instantaneous bubble volumes and locations. Resonance of the bubble cloud, resulting in the highest pressure at the nearby rigid wall, is deduced from simulations with the same initial bubble distribution while varying the excitation frequency and amplitude. This resonance frequency deviates significantly from the classical linearized solution as the relative amplitude of driving pressure increases. It gradually drops as the excitation amplitude increases until reaching a limit value. In the high amplitude driving pressure regime, the peak pressure generated at the wall has a maximum for an optimum value of the initial bubble radius for the same cloud radius. This occurs when the ratio of maximum over initial bubble size is maximum. Too weak or too strong bubble interactions in the cloud inhibit strong collective effects. For the same initial void fraction and for different initial bubble sizes (changing the bubble number) an optimum bubble size also exists resulting in the highest collective pressure.