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Nonlinear ultrasonic waves in water-air mixtures

C. Vanhille^a and C. Campos-Pozuelo^b

^aUniversidad Rey Juan Carlos, Tulipán, s/n., 28933 Móstoles, Madrid, Spain

^bInstituto de Acústica, CSIC, Serrano, 144, 28006 Madrid, Spain

In this paper we present some features of nonlinear ultrasonic waves in water-air mixtures. This analysis is based on the coupling of the linear wave equation to the bubble equation in a volume formulation. The system is solved via the development of a numerical model (SMOW-BL code). The main restrictions of the model are: the nonlinear behaviour comes exclusively from the bubble vibration, all the bubbles have the same size, air inside the bubbles is adiabatic. Continuous waves at low ultrasonic frequency and wide band pulses propagation in an open domain are analysed. Results obtained by considering several bubbly layers in water are given. The existence of soliton in a water-air mixture is demonstrated. Some results corresponding to standing waves are also presented. A model which allows us to consider the self-generation of air bubbles in water, i.e., cavitation, is proposed.