DOI: 10.37102/1992-4429_2026_56_02_06

VARIABILITY OF THE ACOUSTIC FIELD IN THE PRESENCE OF BUBBLE CLOUDS NEAR THE SURFACE OF A SHALLOW SEA

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There are different ideas about the significance of the contribution of the near-surface layer of bubbles to the attenuation and structure of low-frequency sound in the ocean. There is currently no definitive solution to the problem, and research in this area remains relevant. The aim of the work was to identify the main mechanism of the influence of bubble clouds on sound propagation based on new experimental data and theoretical models. To study the effect of the near-surface bubble layer on sound propagation, numerical simulations were performed for shallow seas using the approximation of normal modes. The sound field calculations were performed using the KRAKENC program for interacting modes. Experimental results obtained by backscattering sound at various frequencies in the Sea of Japan were used to characterize the structure and acoustic properties of the upper layer of the sea saturated with gas bubbles. It is shown that the presence of bubble clouds in the near-surface layers leads to a change in both the average decay of the sound field along the sound propagation path and the spatial interference structure of the field. The near–surface layer of bubbles leads to an additional decrease in the field at moderate distances, but at large distances it leads to the absence of the contribution of the bubble layer in the exponential law - only exponential attenuation remains due to dissipative processes in seawater. The disappearance of part of the propagating rays in the region of the bubble layer leads to a coarsening of the interference pattern of the acoustic field, when the interference period increases with increasing bubble concentration.

Keywords: seawater, scattering, sound absorption, bubbles, sound propagation, normal mode method

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