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THE STUDY OF ACOUSTIC MODES BACK-SCATTERING BY BOTTOM RELIEF INHOMOGENEITIES USING THE INVARIANT IMBEDDING METHOD

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In models of sound propagation in a shallow sea with penetrable bottom, the effect of back-scattering of acoustic waves can usually be neglected. The parabolic equation method, for instance, is based on the one-way propagation approximation. Estimations of the magnitude of a back-scattered wave, nevertheless, are almost absent in the literature. In this study, such estimates are obtained in the framework of the adiabatic normal modes theory. This approximation allows us to separate the backward scattering from mode coupling, which is another important effect observed in acoustic wave propagation over bottom relief inhomogeneities. The scattering of a single normal mode on a localized bottom relief inhomogeneity is considered, and the dependence of the amplitude of the backward-scattered wave on the size of the inhomogeneity and mode number is investigated. The numerical solution of the Riccati equation is used for obtaining the reflection coefficient. The latter equation is obtained by transforming the original boundary-value problem for the Helmholtz equation for the mode amplitude to imbedding equations. The possibilities of further generalizations and applications of modal imbedding equations in the issues of underwater sound are discussed.

Keywords: ocean acoustics; normal modes method; invariant imbedding method; back-scattering.

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