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# Remote sensing of the ice-covered seabed

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The most accurate information about the physical parameters of the heterogeneous geophysical environment is obtained using various seismic survey methods. Geophysical surveys in water areas are reduced to two options for work - this is either the use of towed sonar antennas that record signals from an active source, or seismic stations installed on the seabed. In the case of ice cover, technology with towed sonar antennas cannot be used, and the use of bottom seismic stations is difficult both during installation, since ice drilling is required and when extracting data, which usually requires physical access to the receiver. In addition, bottom seismic stations are much more expensive than ordinary ones, due to their more complex structure. Therefore, there is a need to develop new methods of sensing the land for the conditions of ice-covered water areas. This study was dedicated to the solution of this problem.

An optimized program has been created for numerical simulation of the propagation of various types of surface waves propagating in the system “atmosphere — ice cover — water layer — sea bottom” with original solutions. It is shown that the fundamental mode carrying information about the structure of the seabed has a local maximum near the ice cover. Due to this, it is possible to probe the sea depths without using expensive bottom seismic stations, but only with the help of instruments installed on the bottom surface. The sensing procedure is similar to that used on land, with the exception of some particulars, for example, a slightly longer signal accumulation time.

In this case, the bending mode localized near the ice cover is a serious obstacle. Due to the fact that its speed is less than the speed of sound in the air, it does not radiate into the atmosphere, in contrast to the fundamental mode, which emits a side wave. Therefore, recording an acoustic signal in the atmosphere above the ice cover may be more effective for sensing than seismic observations, due to the higher signal-to-noise ratio.

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