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Seismoacoustic observations using seismic array on an ice floe

Alexey Sobisevich, Dmitriy Presnov, Daniil Zagorskiy, Artem Numalov

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POSTER

IPE·RAS
Schmidt Institute of Physics of the Earth of the Russian Academy of Sciences,
Moscow, Russia, presnov@physics.msu.ru

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ABSTRACT

We present the results of seismoacoustic measurements carried out at Lake Baikal in winter 2020. A system of 6 special autonomous geo-hydroacoustic buoys, capable of continuously functioning at least for a week, was used as measuring equipment. Each individual buoy consists of a recording system, a seismometer-velocimeter, a hydrophone and wireless data transmission facilities. The measuring system was placed on an ice surface of the lake, forming a seismic array system. Lake depth at the locations of some buoys reached 400 m, the ice thickness was 1 m.

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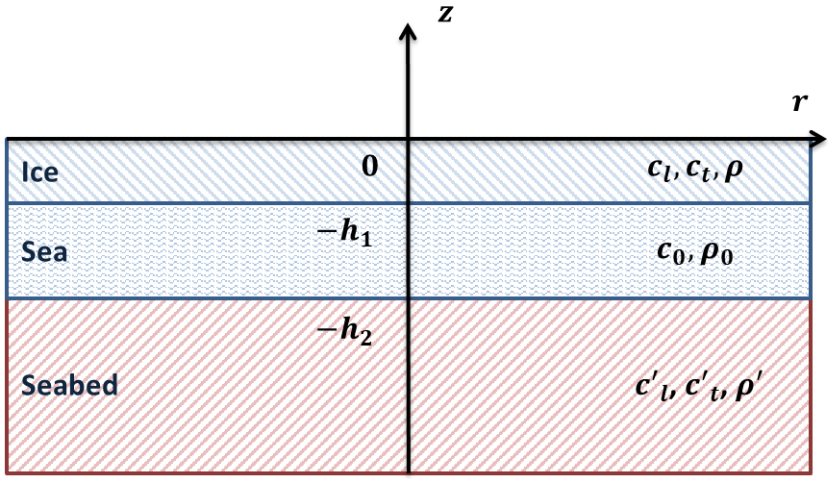
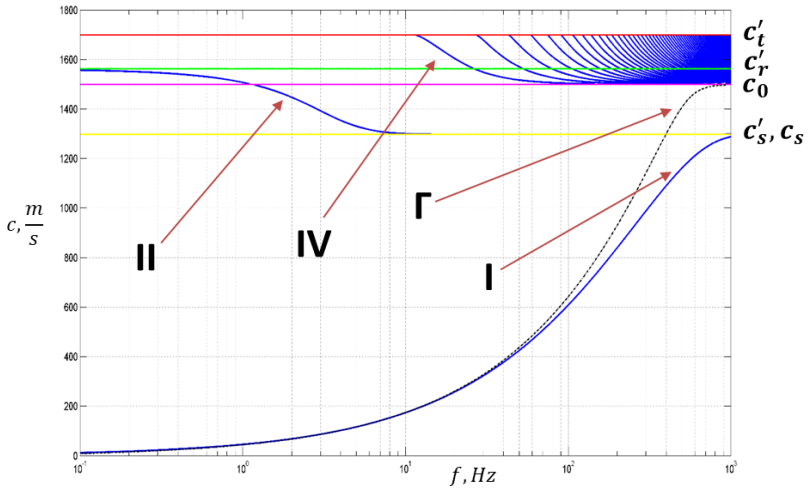
INTRODUCTION

normal wave modes in a layered model



Presnov D.A., Zhostkov R.A., Gusev V.A., Shurup A.S. Dispersion dependences of elastic waves in an ice-covered shallow sea // Acoustical Physics. 2014. V. 60, № 4, P. 455-465.



I – low velocity flexural wave of an ice plate
II – fundamental mode of Rayleigh type surface wave
IV – hydroacoustic modes
Γ – flexural-gravity mode dispersion

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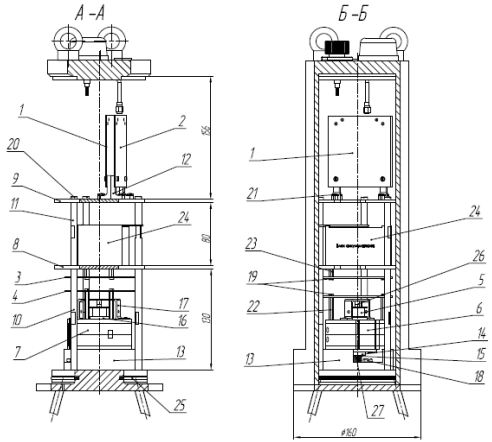
METHODS

Ice class geo-hydroacoustic buoy

1 – 24-bit data acquisition system.
7 – Analog molecular-electronic vertical seismic sensor;
24 – Li-ion battery with interface board;



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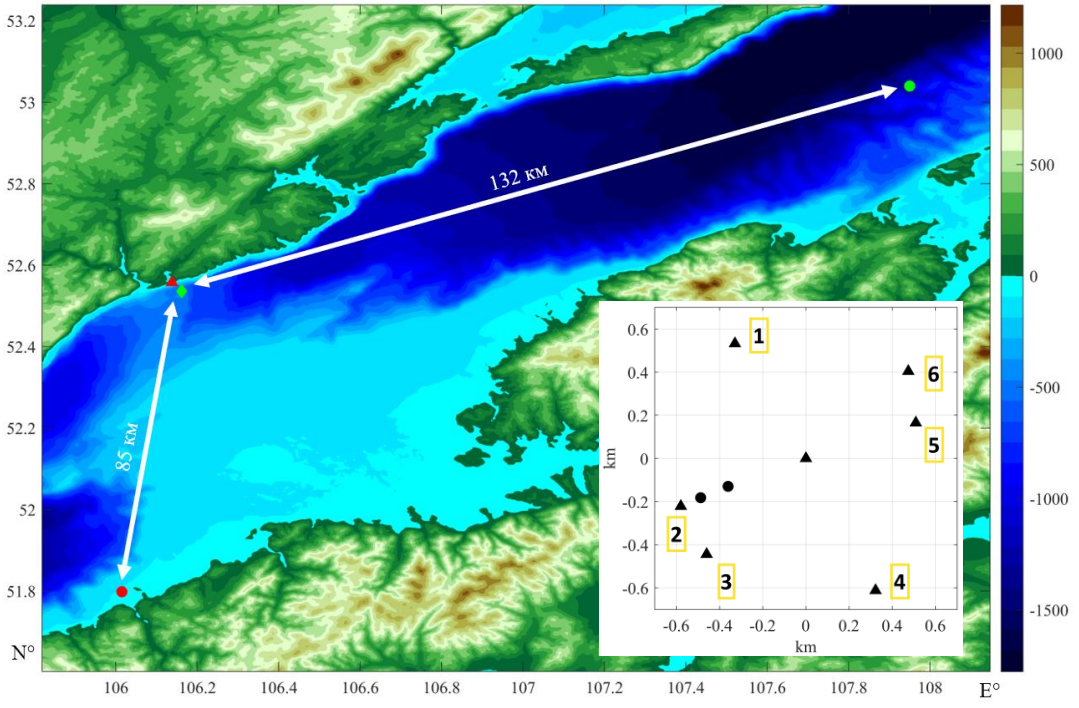
Baikal lake experiment in ice conditions

METHODS

- Seismometer on the shore
- 100-Ton Seismic Vibrator
- Underwater earthquake 15.03.2020
- Seismoacoustic array of 7 stations on the ice



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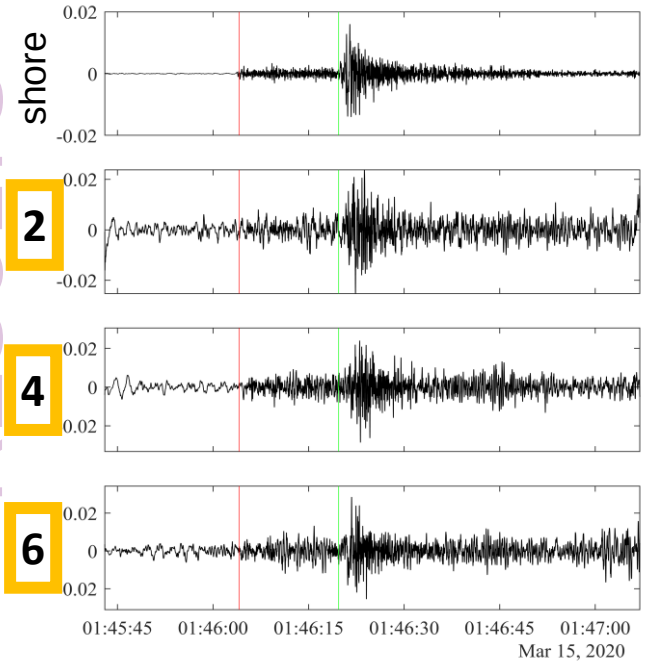
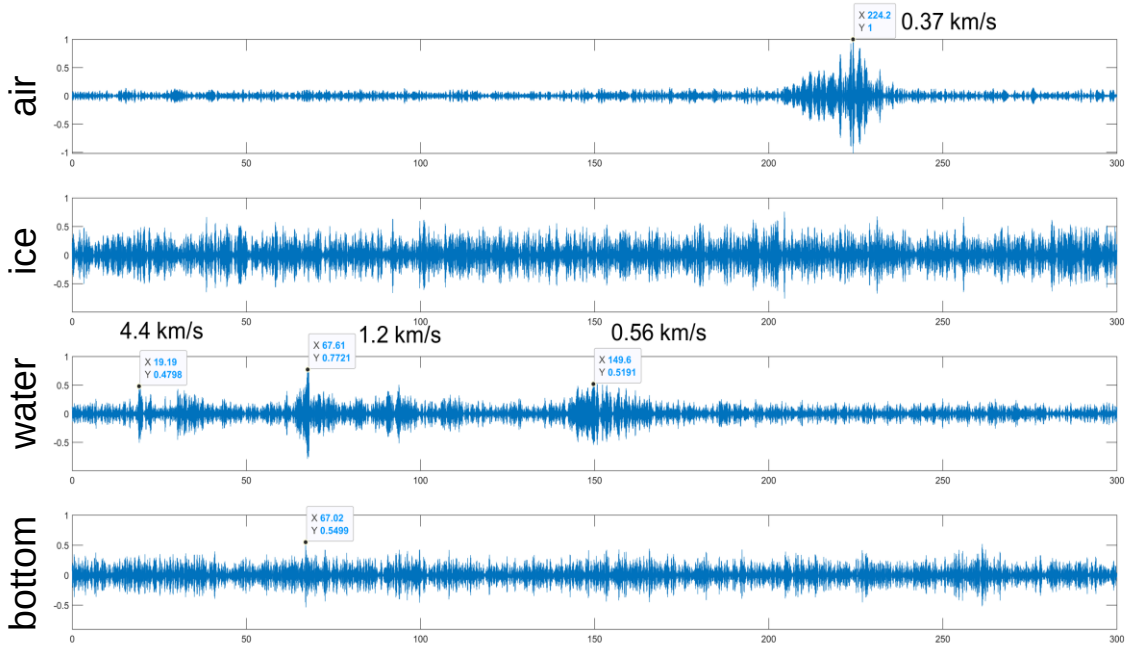
RESULTS

earthquake M~3.2



100-ton vibrator



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CONCLUSIONS

As a result of experimental data processing, the arrival times of several local earthquakes were identified on ice seismograms. Which allow one to study the process of seismic energy transformation into hydroacoustic and back. In addition, a hydroacoustic signal generated by the operation of a distant 100-ton seismic vibrator was recorded in deep water under ice conditions. It can be concluded that geohydroacoustic buoys have demonstrated the convenience and high reliability of use in severe winter conditions. Thus, the possibility of placing seismic arrays on drifting ice floes in the Arctic for solving problems of seismoacoustic monitoring can be considered confirmed.