

ACOUSTIC MONITORING OF HYDROPHYSICAL PROCESSES IN OCEAN SHELF ZONES

**Yury MORGUNOV, Yury POLOVINKA,
Dmitry STROBYKIN**

**V.I. Il'ichev Pacific Oceanological Institute,
Russian Academy of Sciences, 2009**

Marine Station of POI



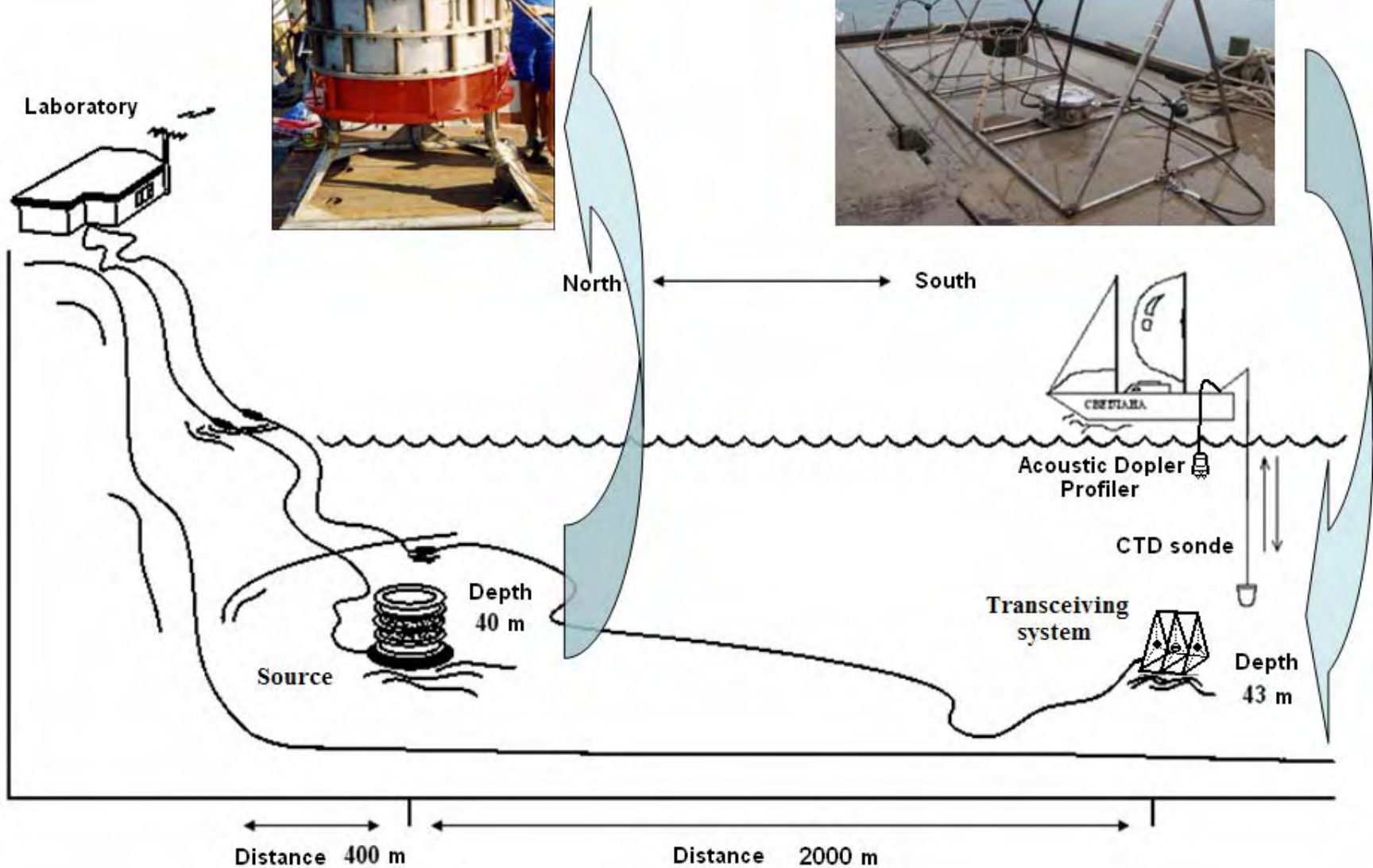
Purpose:

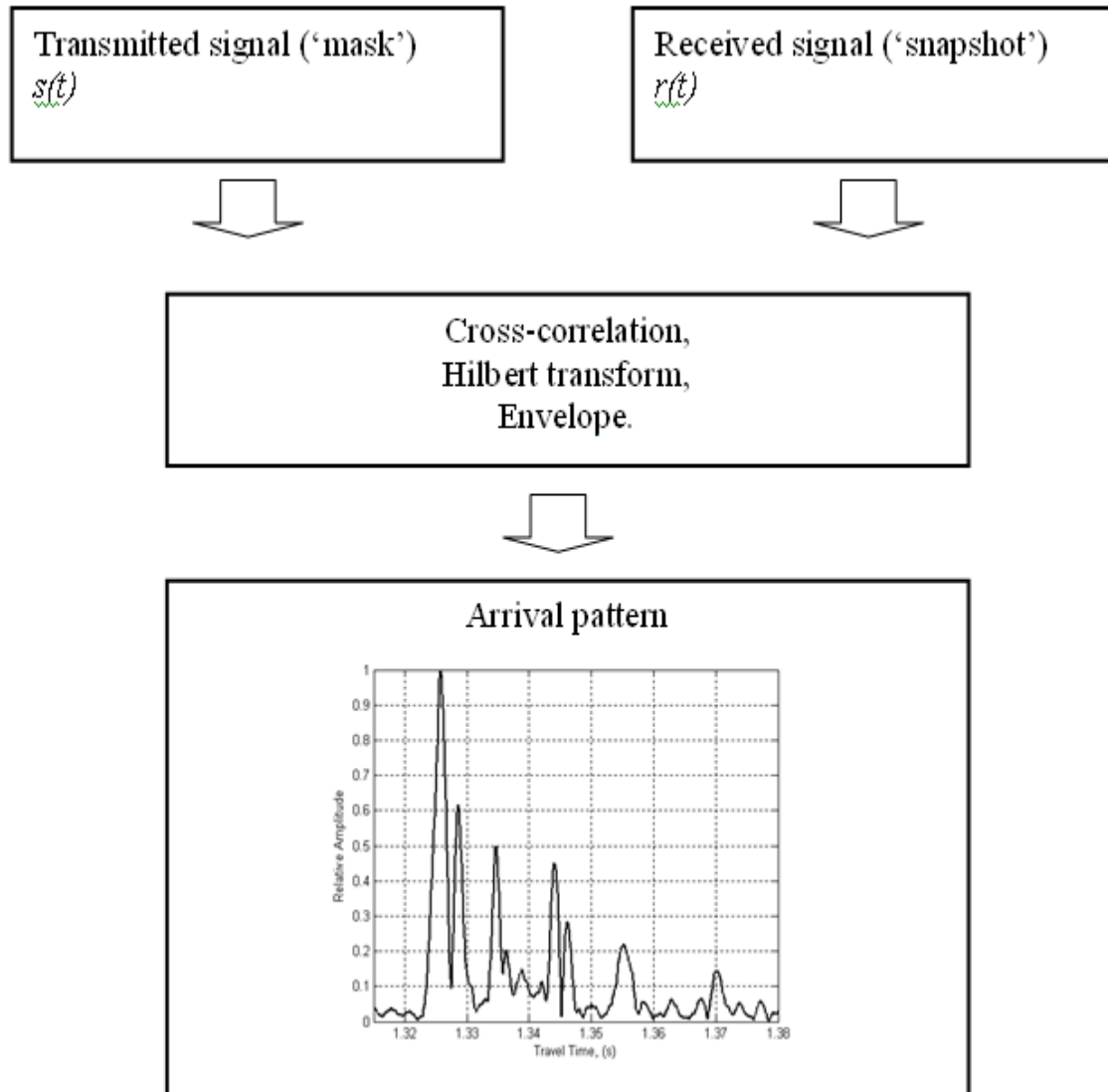
Experimental studies of temperature fields changeability in the East/Japan Sea shelf zone by the methods of acoustic tomography

Sounding signals

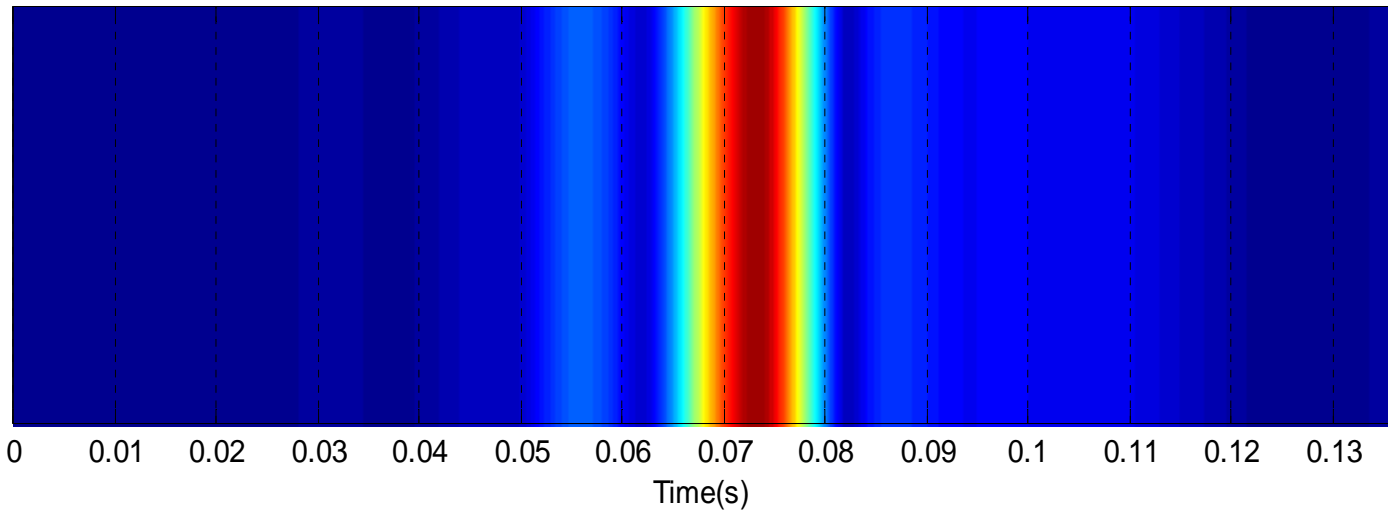
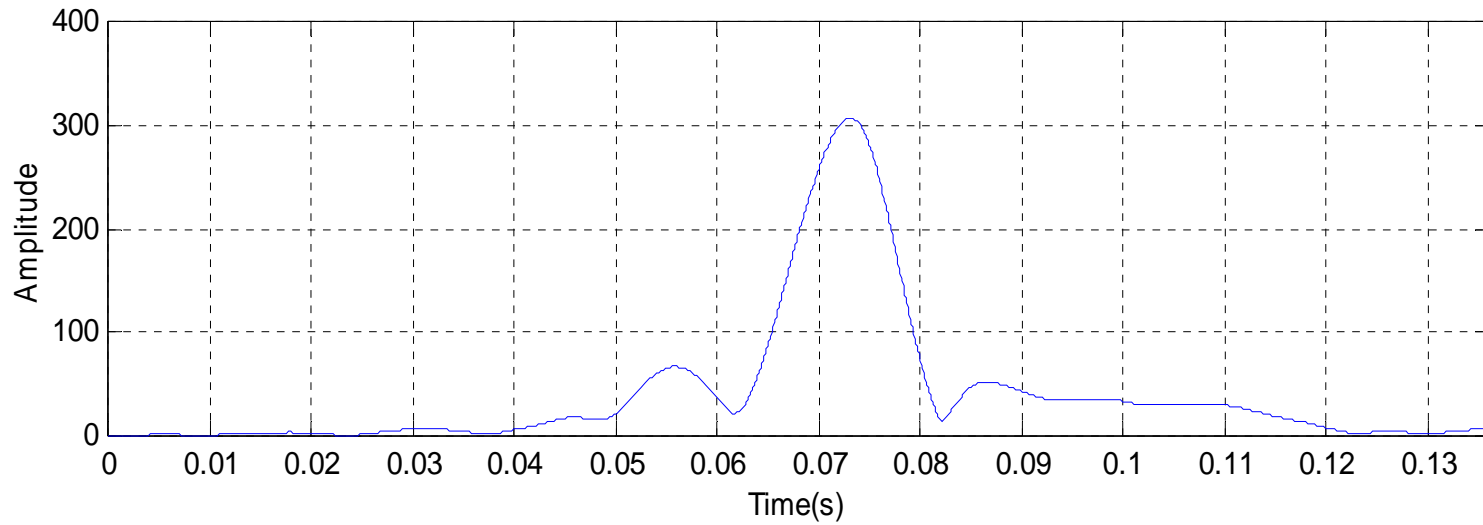
- **Phase-manipulated signals with length of 0.8 s with the signal frequency 2500 Hz were used.**
- **M-sequences, 511 symbols, 4 periods of carrier frequency per symbol**
- **Every minute transmission of pulsed signals was performed by the sound source with durations from 24 to 72 hours.**

Geometry of the experimental equipment positioning





The data processing consisted of calculating the cross correlation function between the received signals and the transmitted signal mask, which was preliminarily recorded by the PC.



Cross-correlation function of the received and transmitted signals

Wideband source

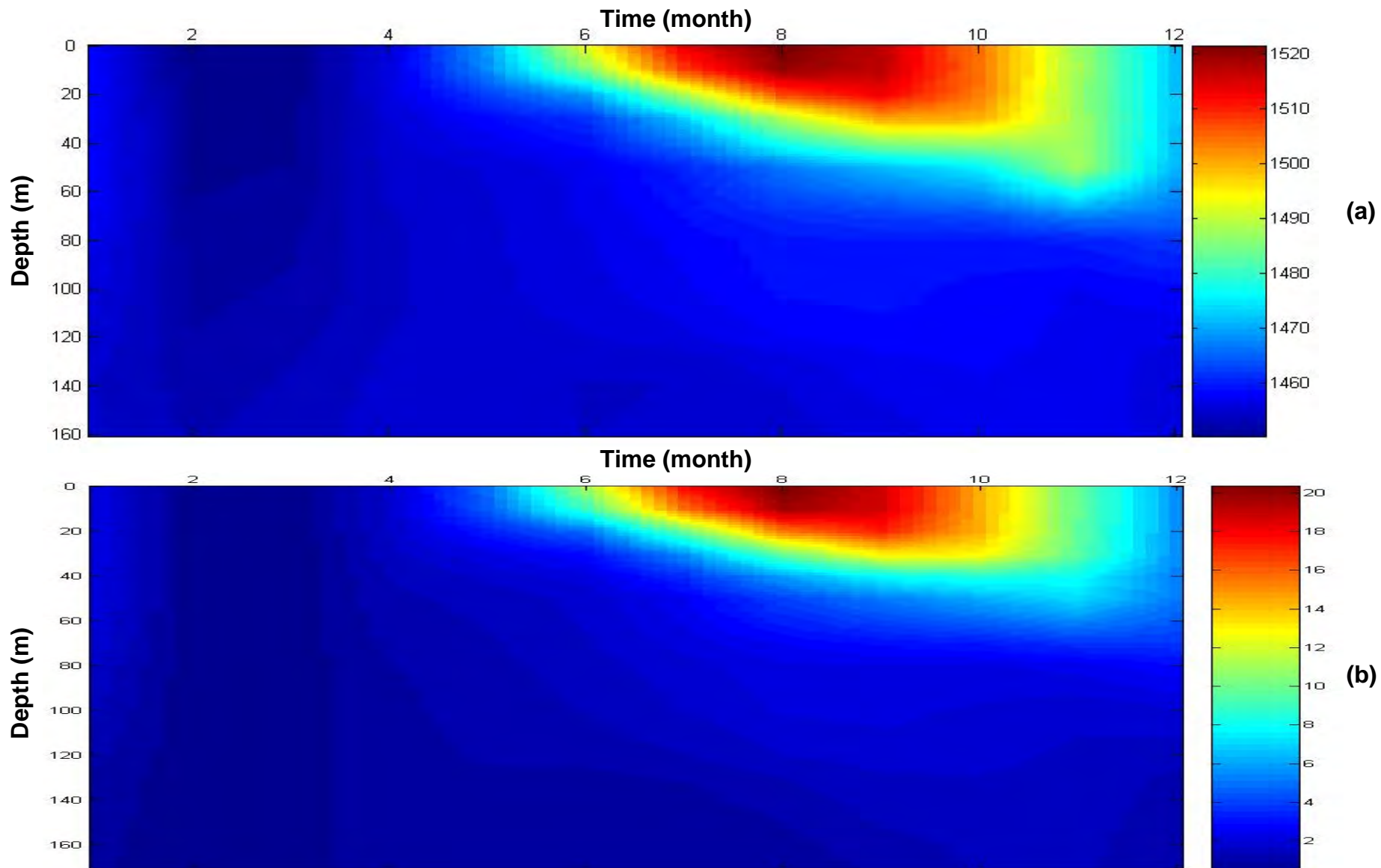


Transceiving system



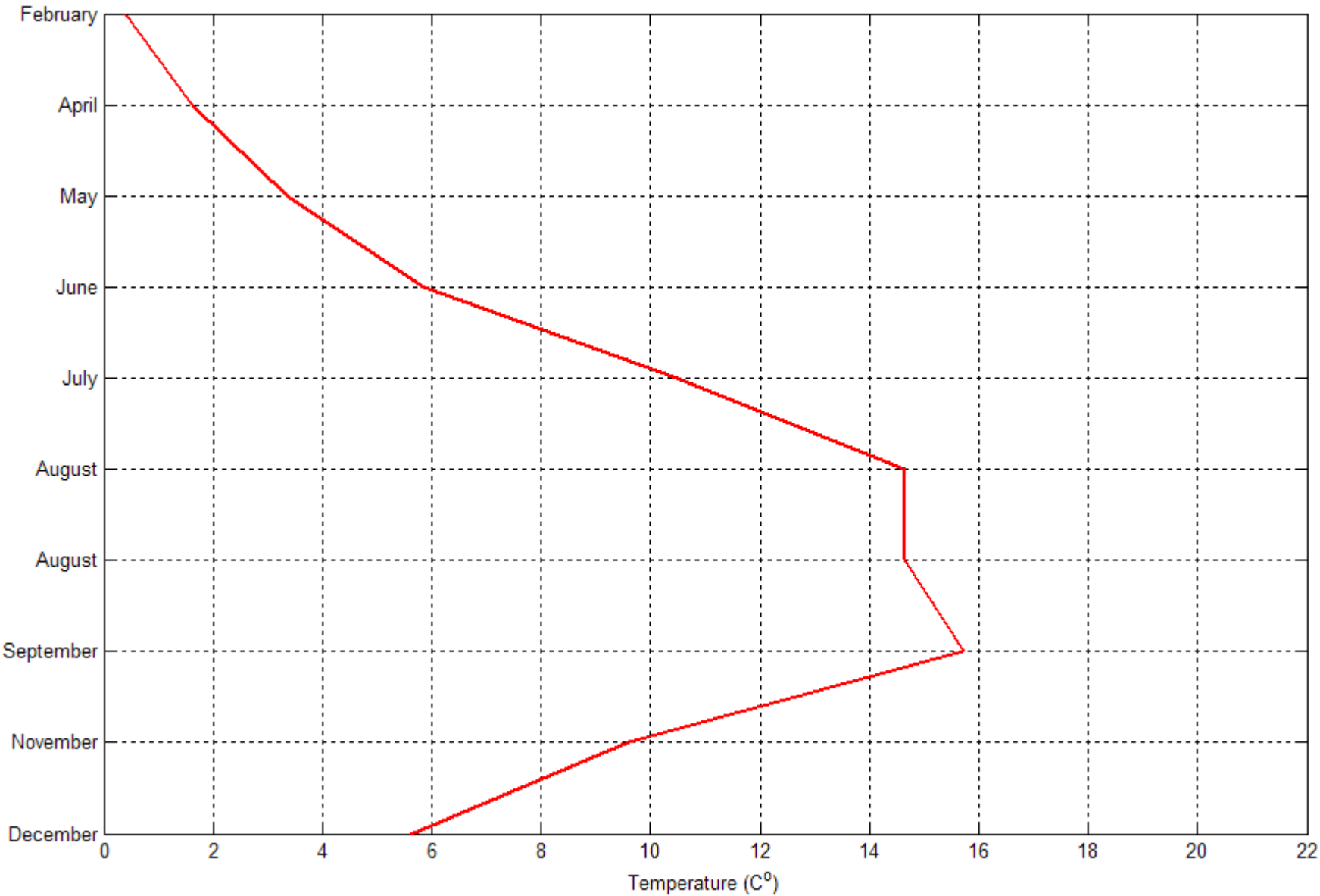


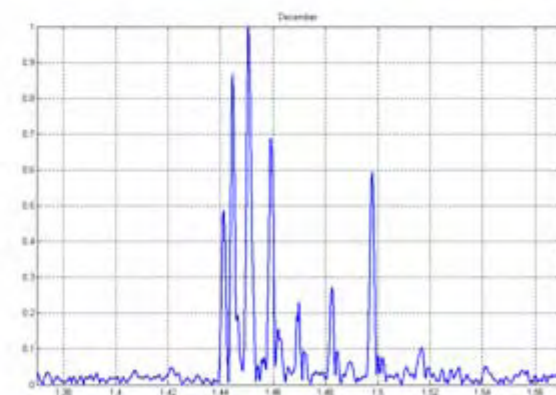
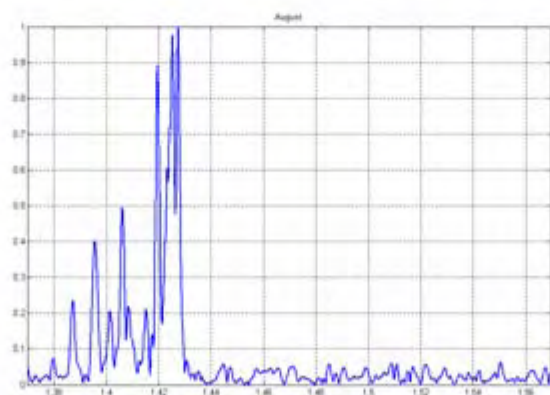
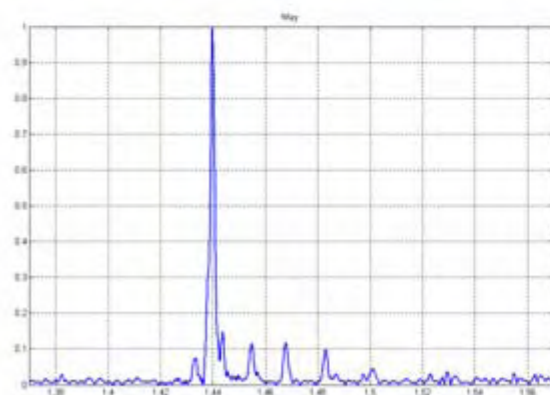
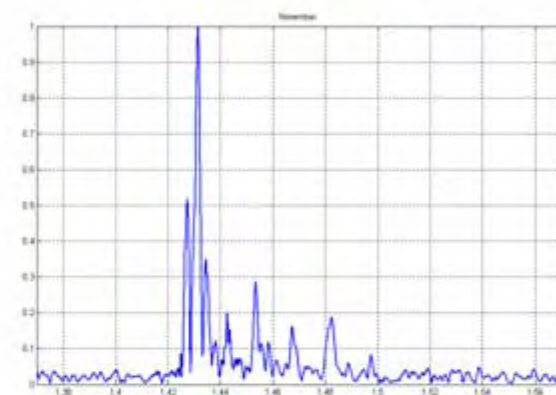
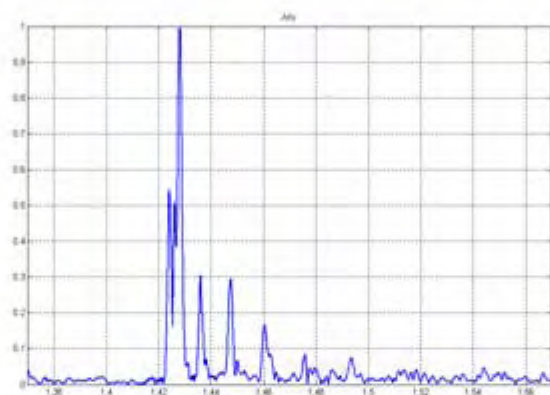
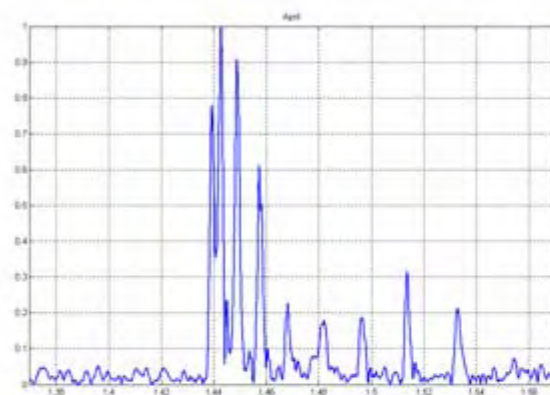
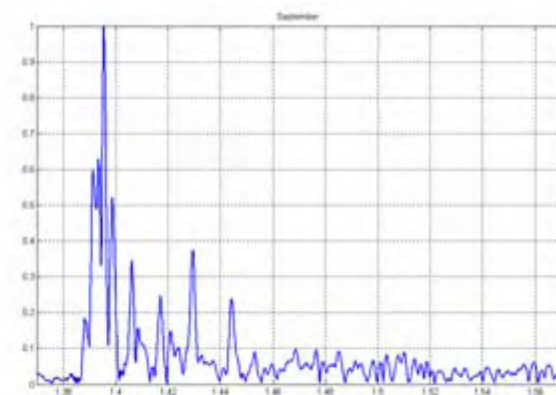
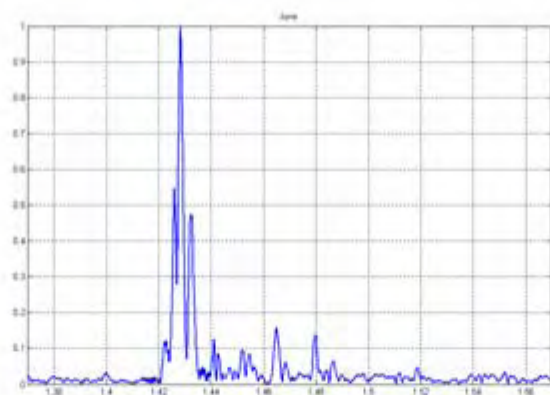
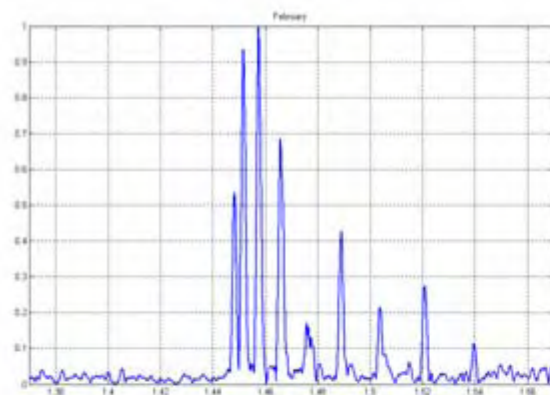
**The sea chart of the acoustic monitoring experiments of hydrophysical characteristics conducted in the East/Japan Sea shelf zone.
(S – source; R – receiver; G1-G4 - points of hydrological measurements)**

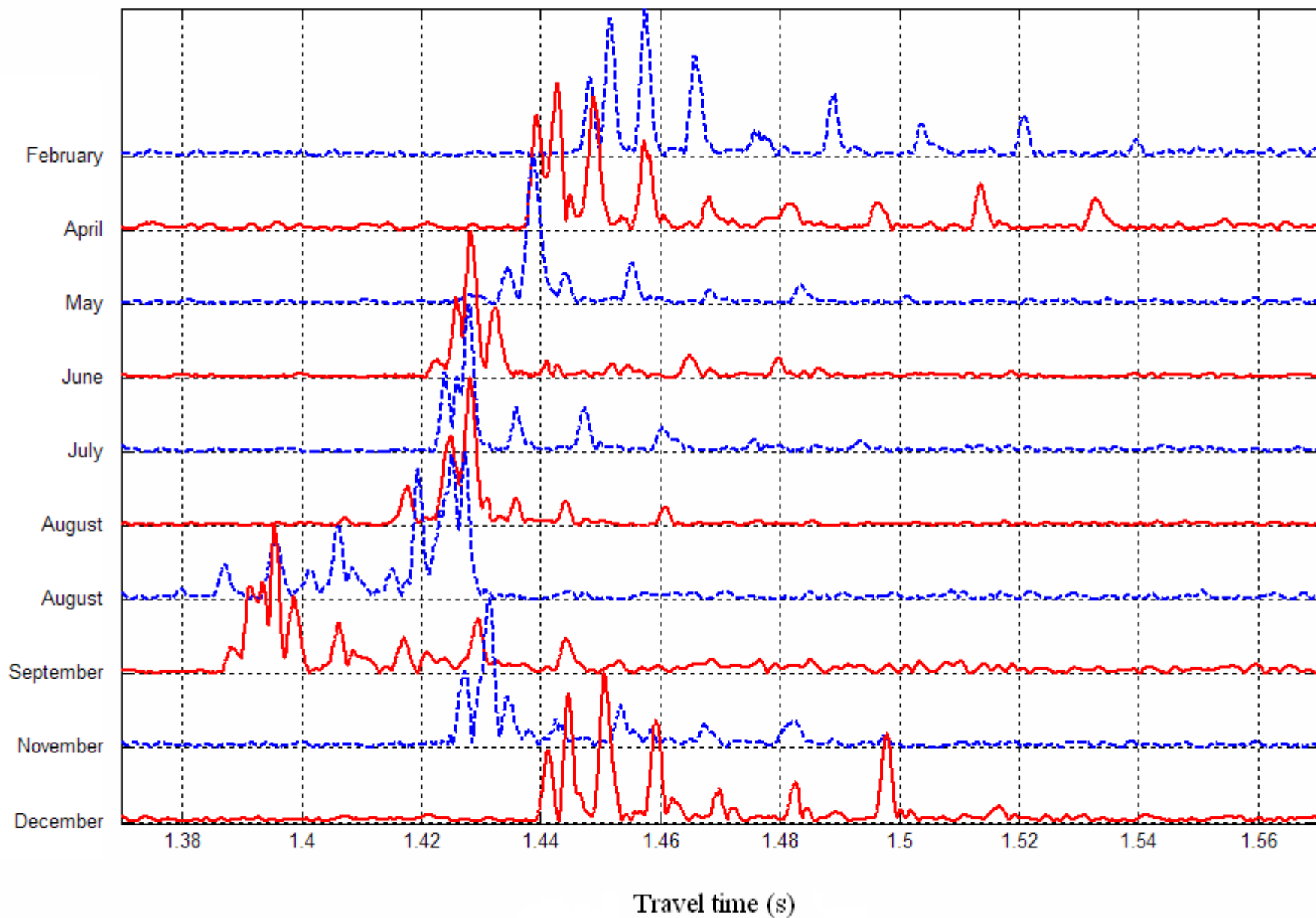


Space-time variability of sound speed(a) and temperature(b) in East/Japan Sea shelf zone (point G2).

Average temperature of water column calculated by average multiyear data of sound speed at the point G2.

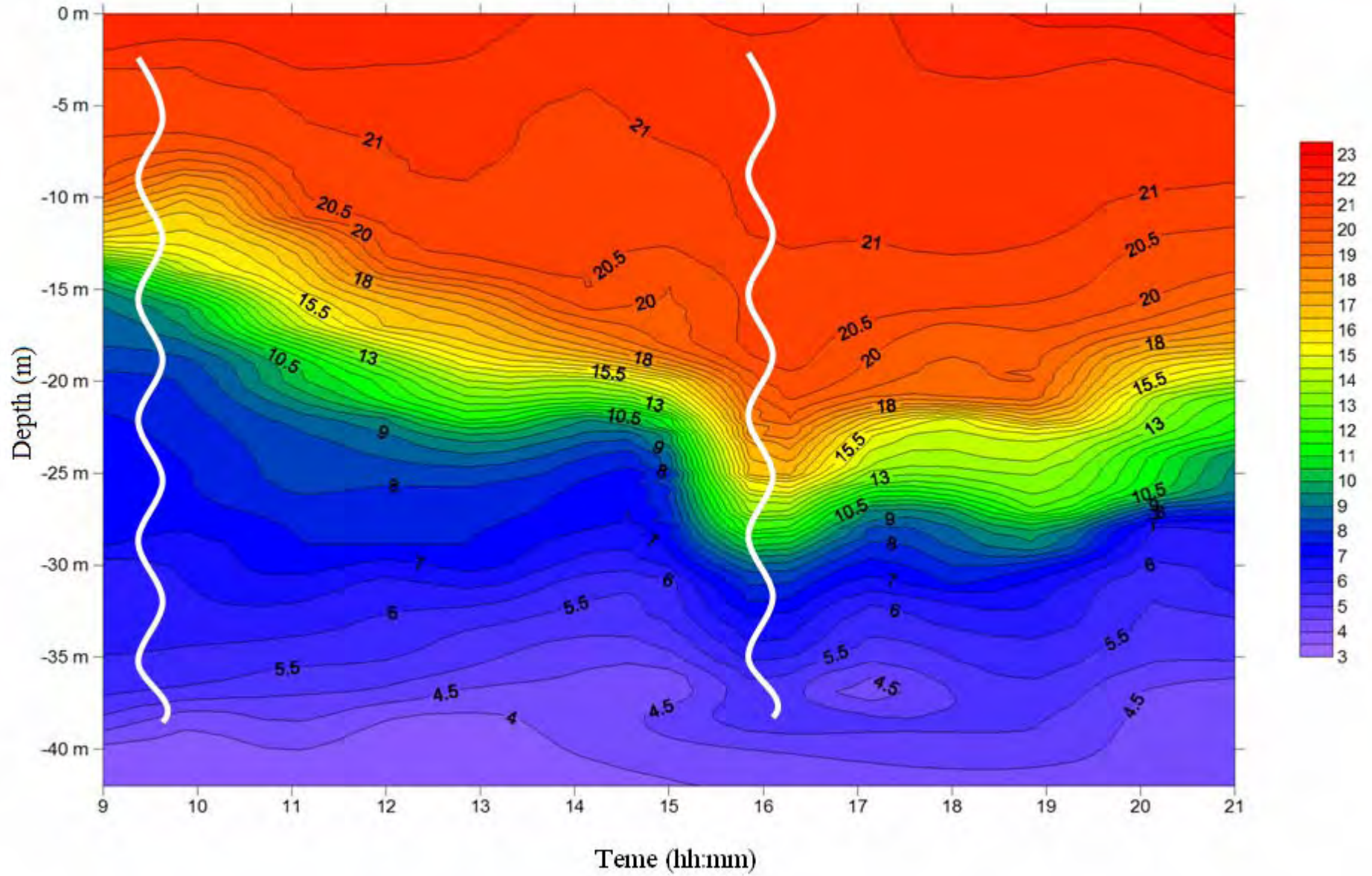


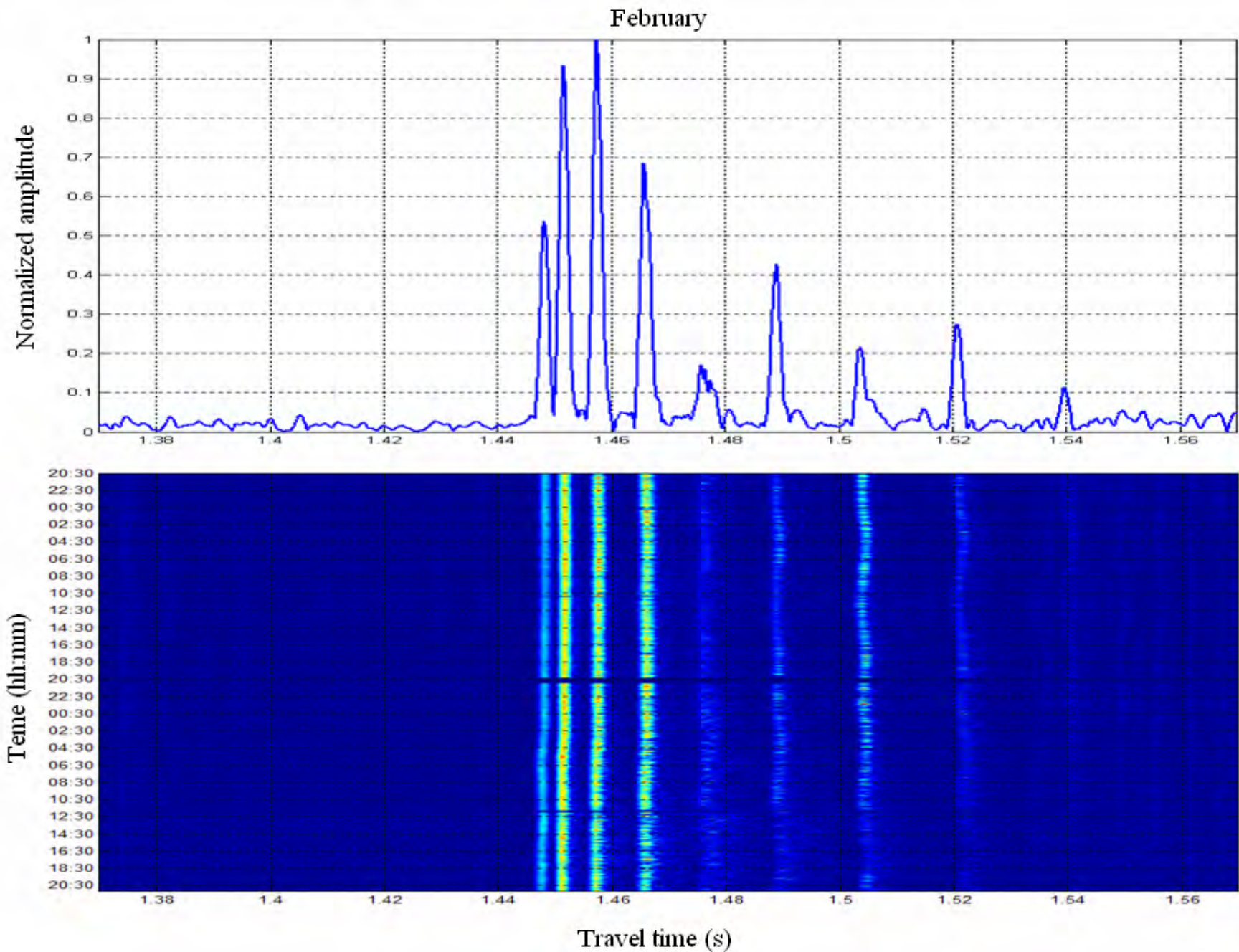




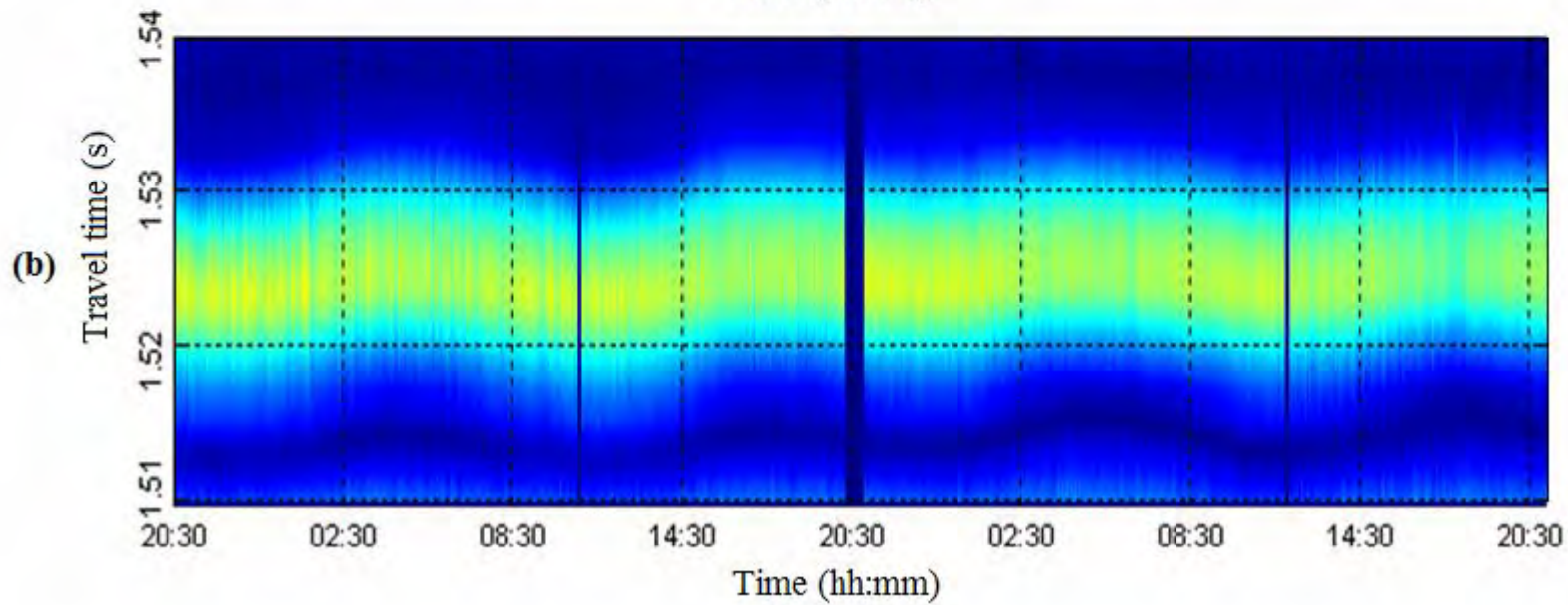
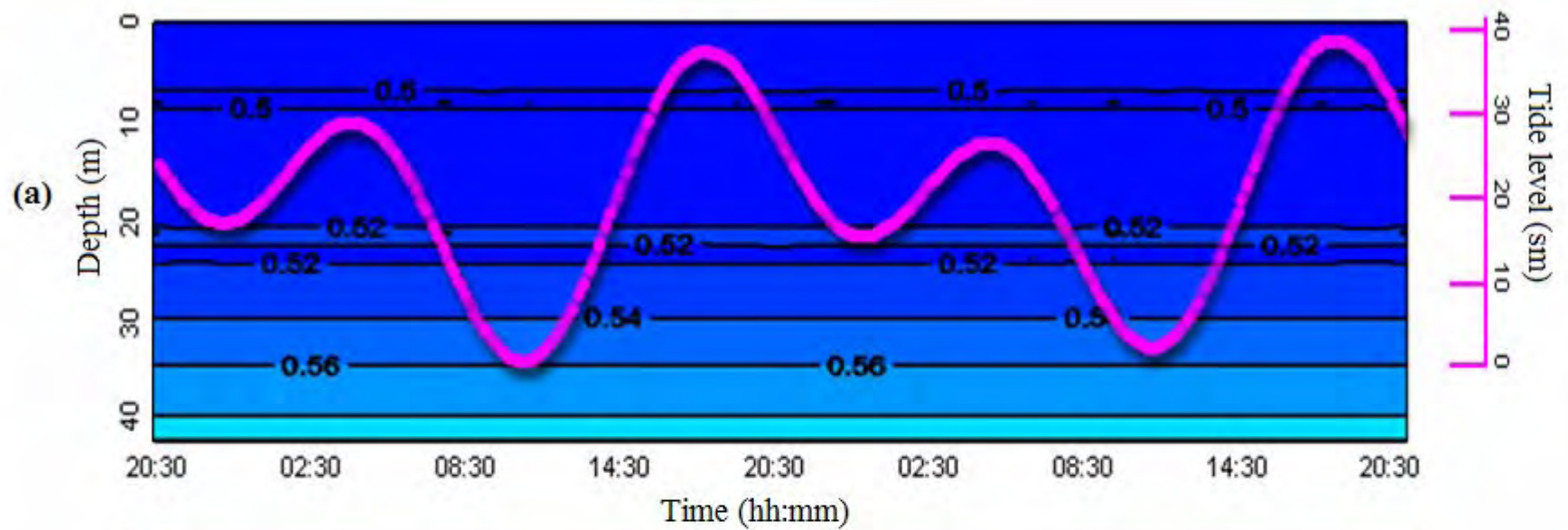
Experimentally obtained pulse characteristics of the waveguide

Hydrology



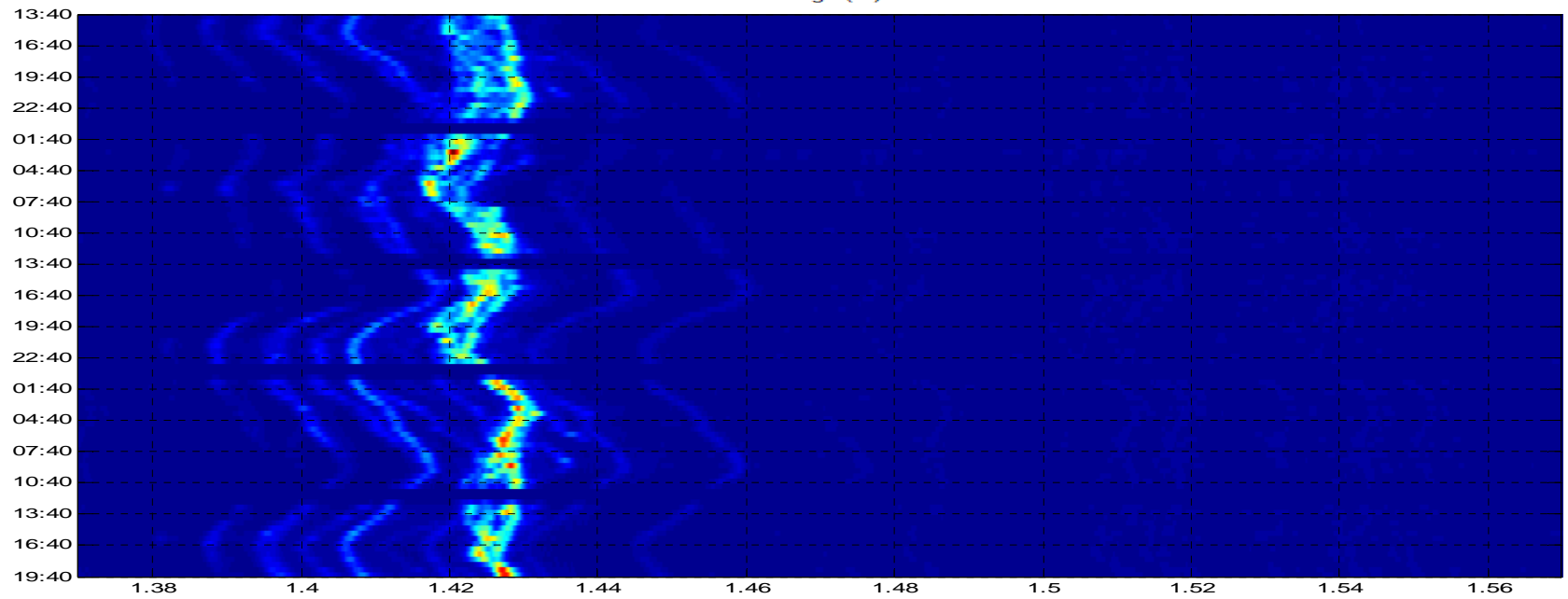
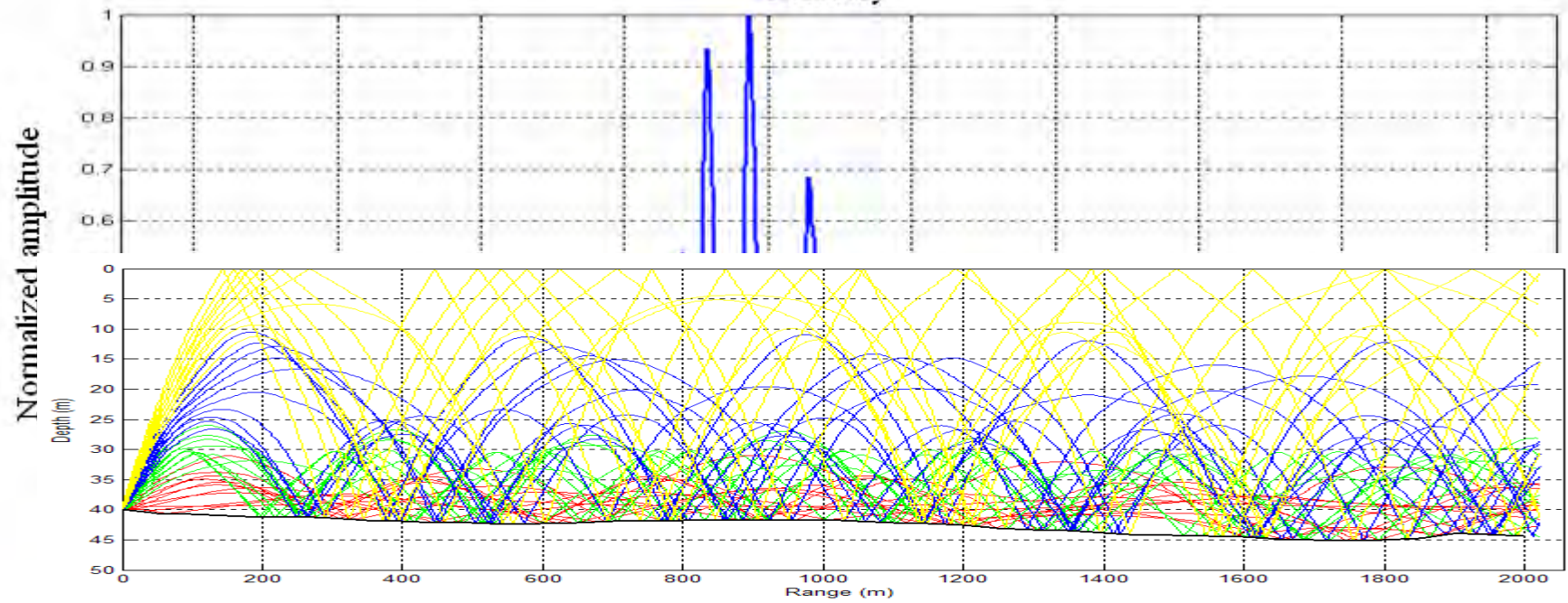


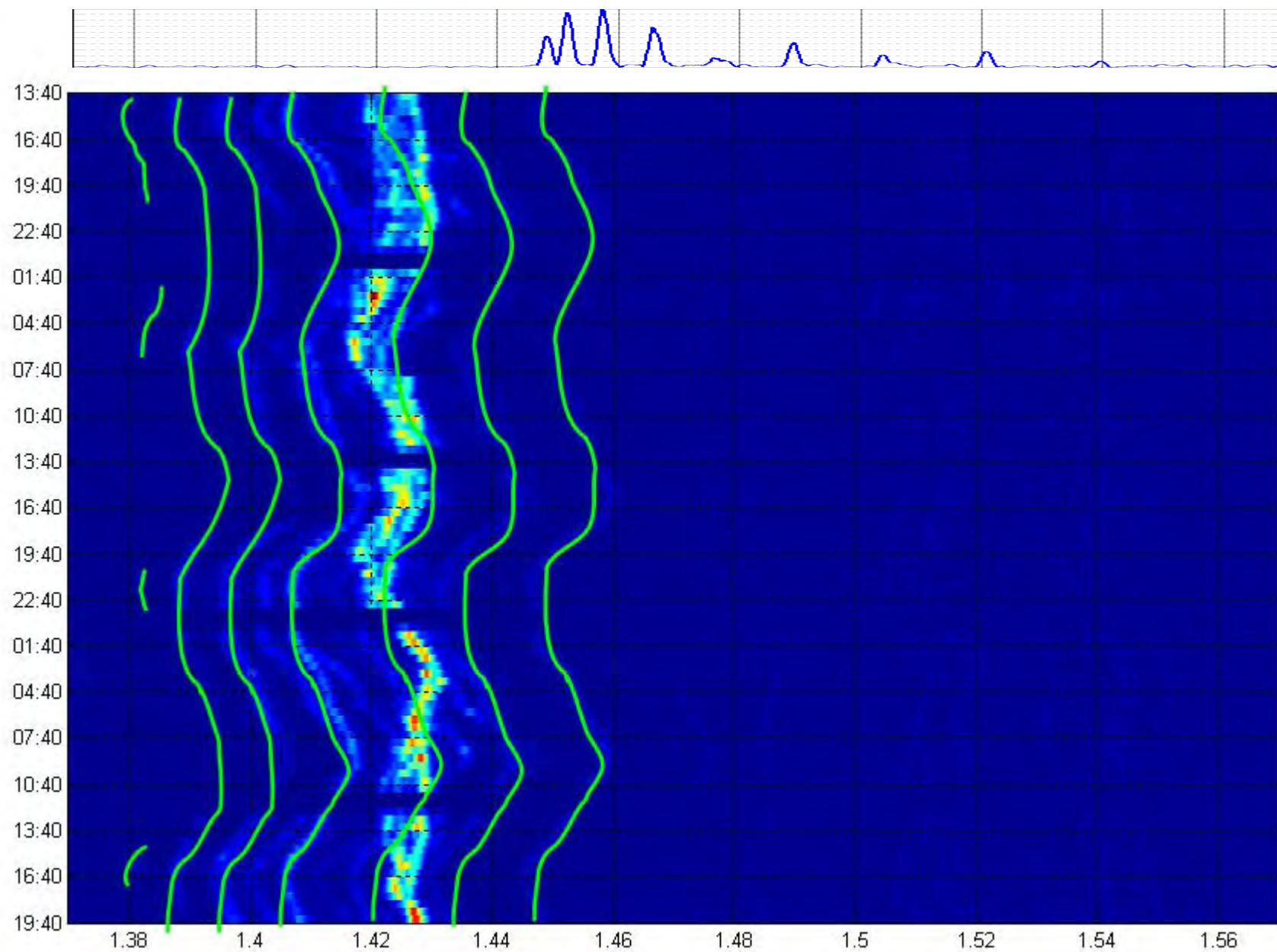
Instantaneous and 72 hours pulse characteristics

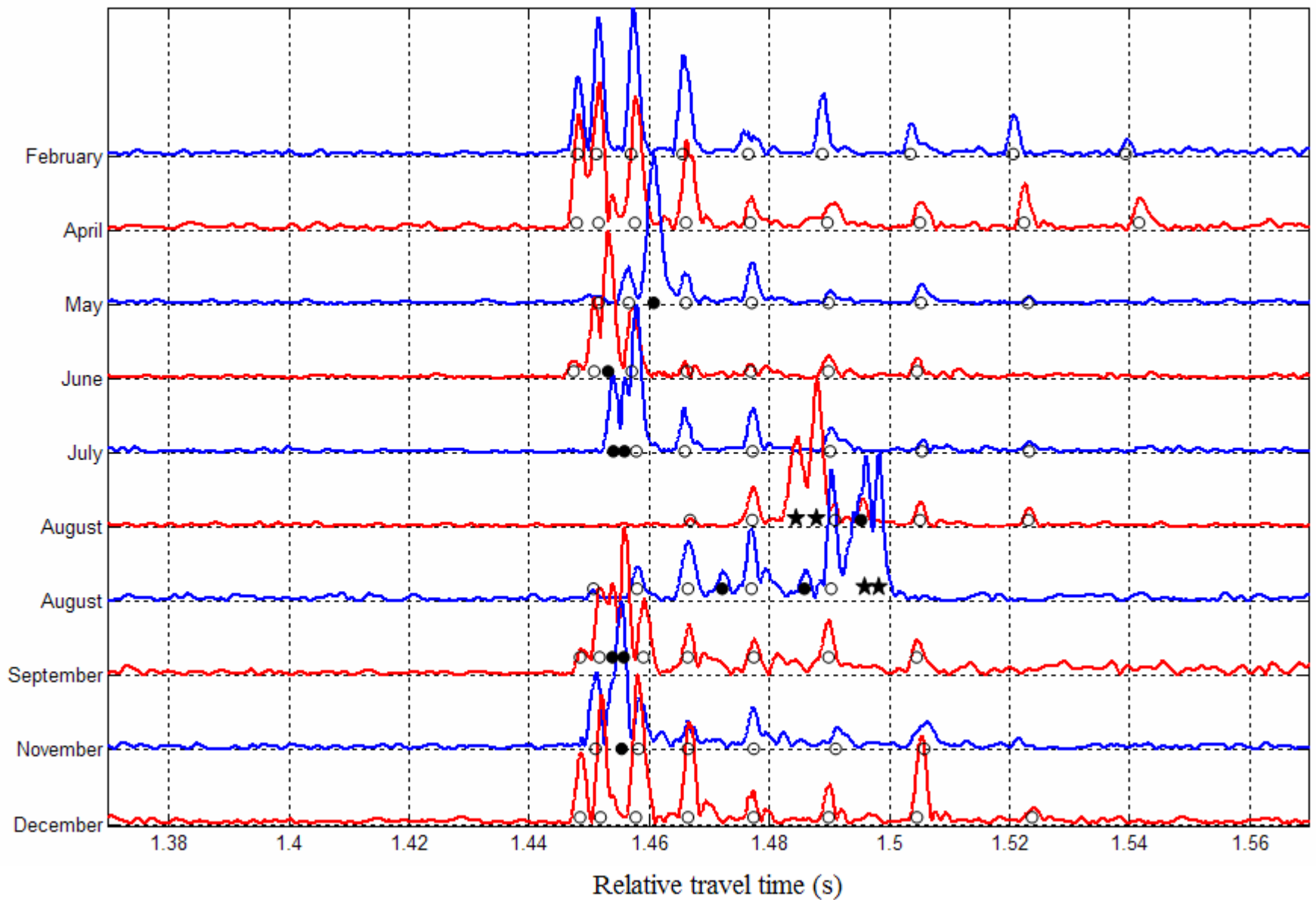


- a) - dependence of water temperature and rise of tide on time at different depths;
 b) - variations of pulse characteristics of the waveguide.

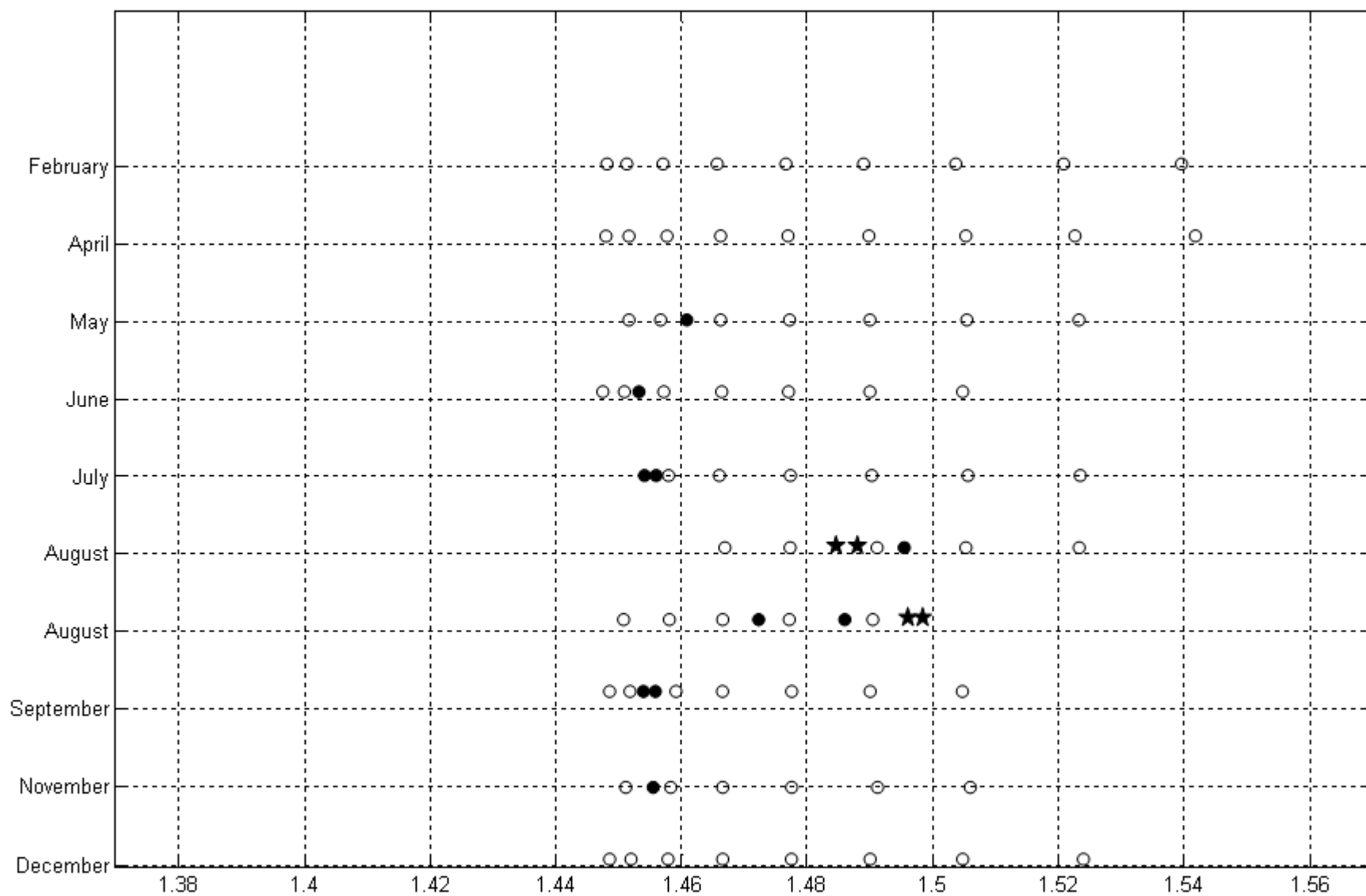
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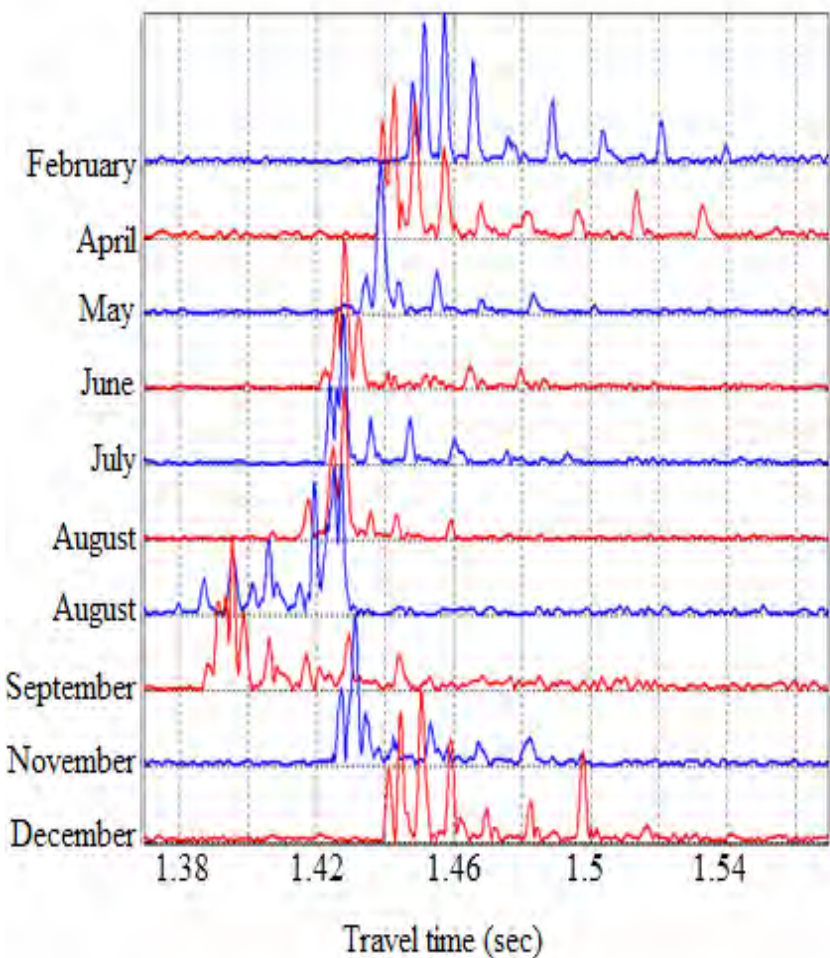




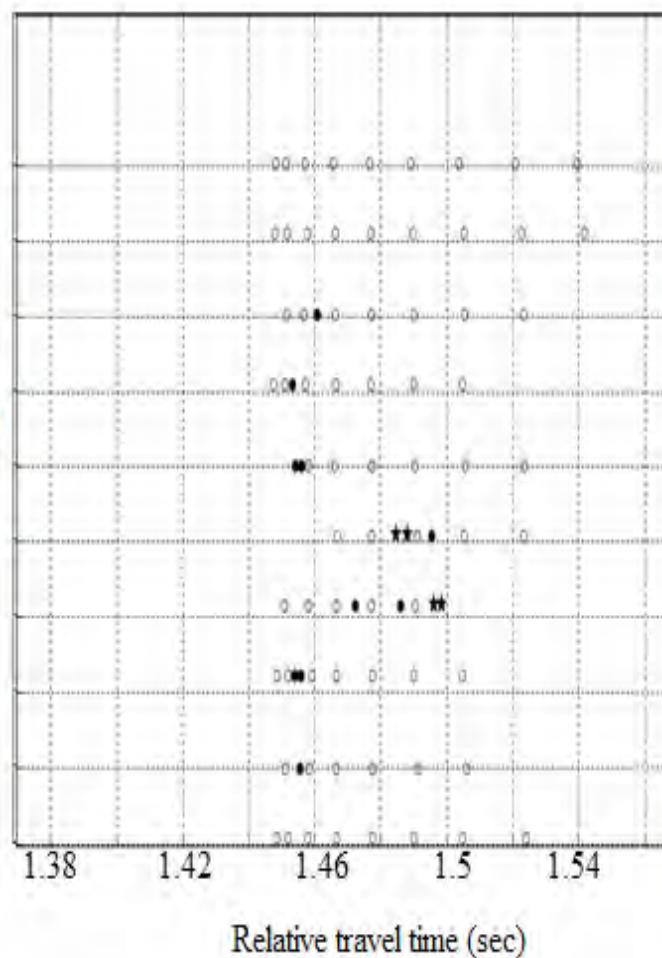


Relative travel time of pulses, obtained by shifting of pulsed characteristics

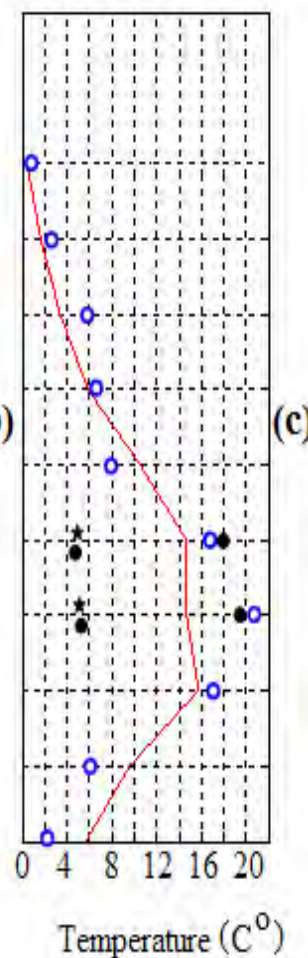




(a)



(b)



(c)

- (a) - typical pulse characteristics over a month of the waveguide;
 (b) - relative travel time of pulse arrivals;
 (c) - average temperature of water column:
 (contour circles) - obtained by the acoustic monitoring data;
 (solid line) - calculated by average multiyear oceanological data;
 (solid circles) - measured average temperatures of the waveguide and near-bottom layer;
 (stars) - obtained by the acoustic monitoring data temperatures of near-bottom layer

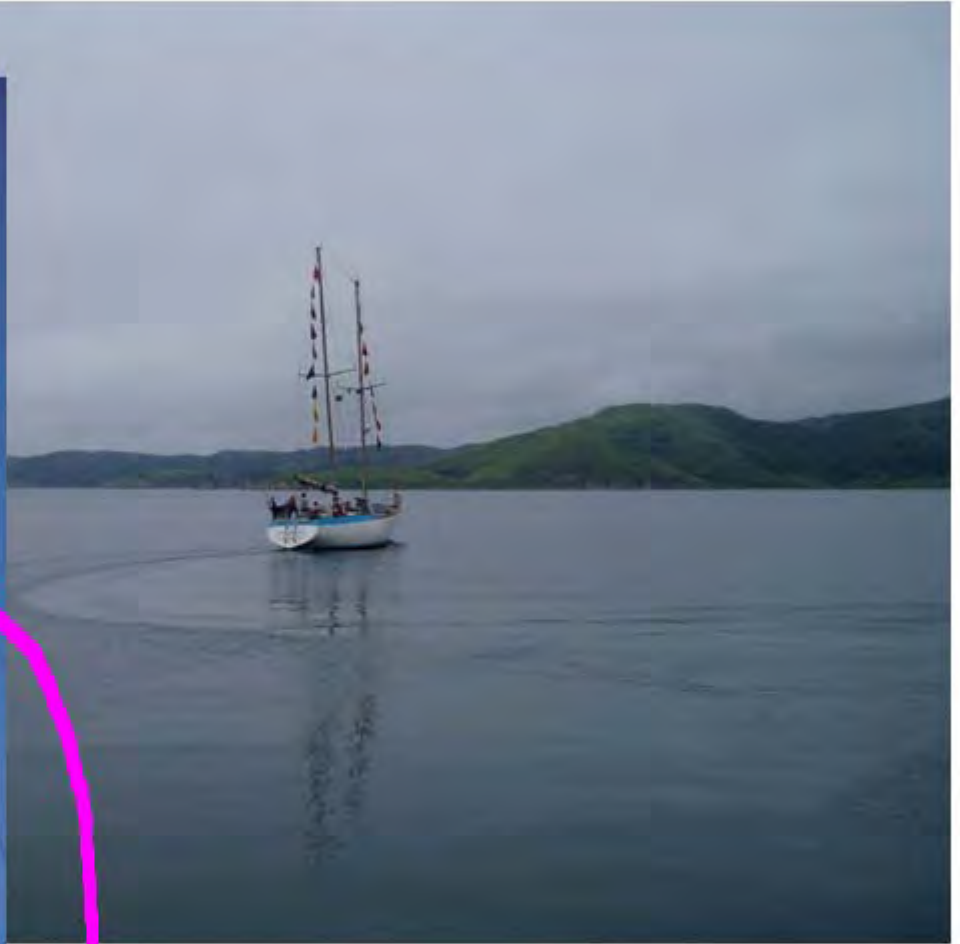
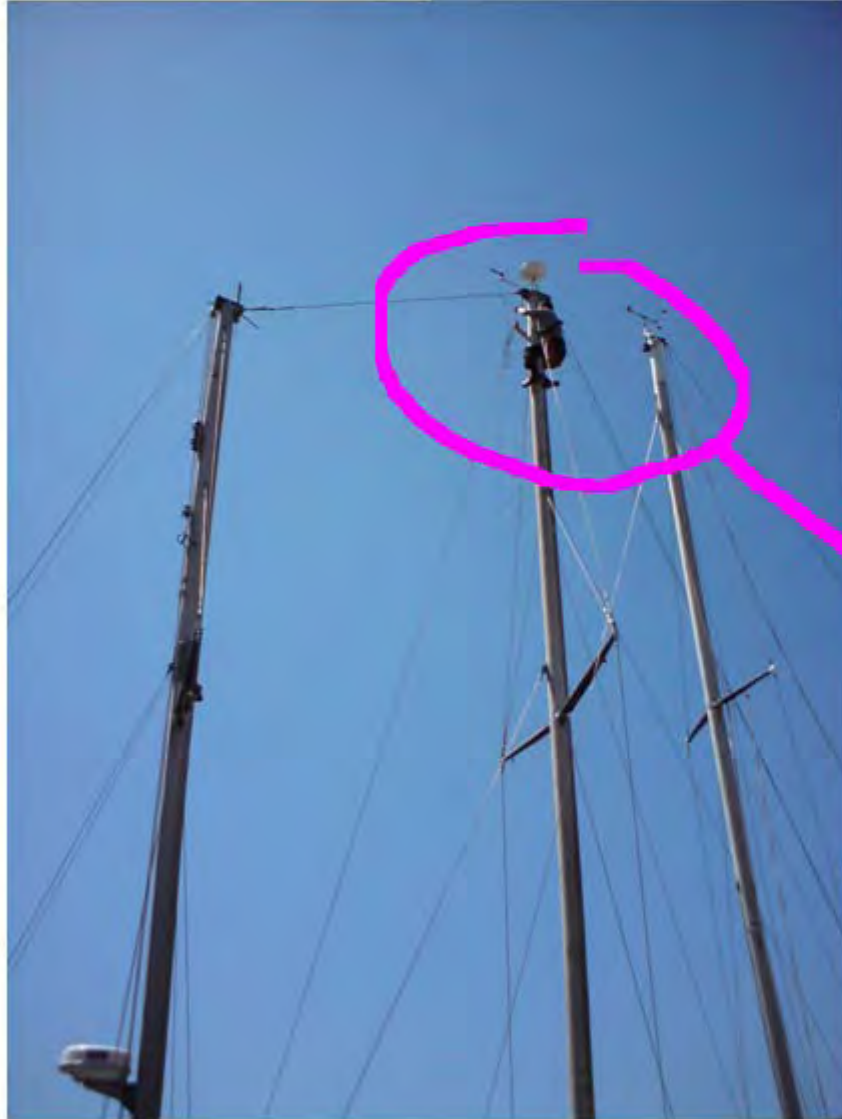
CONCLUSIONS

- The proposed results of experimental measurements testify to the feasibility of remote acoustic monitoring of sound speed and temperature in the course of long-term measurements.
- The acoustic bottom system, both inexpensive and resistant to creeping, can be used efficiently for thermometry of the ocean shelf zones.
- It is experimentally demonstrated that by analyzing the time structure of pulsed characteristics, the vertical distribution of temperature could be qualitatively estimated.

THANK YOU



THANK YOU



It's me! ;)