

IMPROVING ECHO SOUNDER DEPTH ACCURACY USING THERMOMETRIC DATA

A.N. Samchenko, A.V. Kosheleva, A.A. Pivovarov, I.O. Yaroshchuk

This paper demonstrates the impact of hydrological processes on bathymetric surveys conducted with standard echo sounders. It proposes correcting the obtained depths using sea temperature measurements. Temperature is known to significantly affect the speed of sound in water. Although some echo sounders allow setting an average water temperature or can be equipped with temperature sensors, the sea surface temperature can significantly vary from the average temperature of the water column. For nearly two decades, the authors have been conducting hydrological and acoustic research in the shelf zone of the southwestern part of Peter the Great Bay (the Sea of Japan). The hydrology in the bay is characterized by high variability during the summer and autumn seasons, with high-frequency, intense internal waves observed against a background of low-frequency oscillations. The temperature profile in the bay at sea depths exceeding 40 meters typically features a single, well-defined surface thermocline that forms in spring as the upper layer warms, whereas up to three distinct thermoclines can be observed in late summer. In October, a high-gradient thermocline occurs, where the temperature can change by up to 18 °C within a 10-meter depth interval. Consequently, the depth determination error can reach 3.5%, or 2.5 meters for a sea depth of 70 meters.

Keywords. echo sounder, acoustic signals, bathymetry, thermometry, internal waves, thermocline, Peter the Great Bay, the Sea of Japan.

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About the authors

SAMCHENKO Alexander N., Ph.D., Senior Researcher
V.I. Il'ichev Pacific Oceanological Institute, Far Eastern Branch,
Russian Academy of Sciences
Address: 43 Baltiyskaya Str., Vladivostok, Russia, 690041
Research interests: geoacoustic modeling, low-frequency hydro-
acoustics, seismoacoustics, shelf and coastal geomorphology
E-mail: samchenko.an@poi.dvo.ru
ORCID: 0000-0002-5184-0718

KOSHELEVA Alexandra V., Researcher
V.I. Il'ichev Pacific Oceanological Institute, Far Eastern Branch,
Russian Academy of Sciences
Address: 43 Baltiyskaya Str., Vladivostok, Russia, 690041
Research interests: hydroacoustics, oceanology, data processing
E-mail: kosheleva@poi.dvo.ru
ORCID: 0000-0001-6508-6325

PIVOVAROV Alexander A., Researcher
V.I. Il'ichev Pacific Oceanological Institute, Far Eastern Branch,
Russian Academy of Sciences
Address: 43 Baltiyskaya Str., Vladivostok, Russia, 690041
Research interests: hydroacoustics, hardware, oceanology
E-mail: pivovarov@poi.dvo.ru
ORCID: 0000-0003-0037-1568

YAROSHCHUK Igor O., Dr. Sc. (Phys. & Math.), Head of
Laboratory
V.I. Il'ichev Pacific Oceanological Institute, Far Eastern Branch,
Russian Academy of Sciences
Address: 43 Baltiyskaya Str., Vladivostok, Russia, 690041
Research interests: statistical hydroacoustics, statistical modeling,
seismoacoustics, oceanology
E-mail: yaroshchuk@poi.dvo.ru
ORCID: 0000-0002-3212-9752

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