

ASSESSMENT OF REQUIREMENTS FOR THE ACCURACY OF THE OCEANOGRAPHIC PROBE SENSORS FOR INDIRECT DETERMINATION OF SEAWATER SALINITY

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Target. The issues of measuring the mass of dissolved substances or absolute salinity under environmental conditions in situ using automated instruments still remain open. How these issues are likely to be resolved depends on the development of new oceanographic measurement technologies. Salinity is one of the seawater parameters that cannot yet be directly measured in situ. Until now, all known, existing or promising, methods for determining salinity are indirect. The purpose of this work is to find the maximum sensitivity coefficients in order to assess the uncertainty of sensors of input quantities and compare various methods for indirect determination of salinity.

Methods and results. To solve this problem, the work uses methods of direct and inverse metrology problems. In this work, these problems were solved for four fundamentally different methods of indirect (calculated) determining of the salinity of sea water: 1) the relative electrical conductivity method (RCM), 2) the speed of sound method (SSM), 3) the density method (DM) and 4) the refractive index method (RIM). Depending on environmental conditions, the maximum values of sensitivity coefficients (13 coefficients in total) for the output value (salinity) were found for all input parameters of each method. By solving inverse problems for the accepted conditional base level of salinity uncertainty and at maximum sensitivity coefficients, estimates of the uncertainty of sensors of input parameters for each of the four methods were calculated.

Conclusions. The results obtained make it possible to estimate the required accuracy of sensors of input quantities at any given level of uncertainty of the output quantity or the actual accuracy of the output quantity at any given level of uncertainty of sensors of input quantities. From the three promising methods for indirect salinity determination, MPP is the best candidate to replace MOE in the near future.

Keywords: sea water, conductivity, speed of sound, density, refractive index, salinity, measurement, sensor, oceanographic probe, indirect measurements, uncertainty, metrology

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