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Using the optimum multiparameter analysis to study the water masses of the North Atlantic

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Water mass is one of the basic concepts of oceanography. Properties of water masses change as a result of horizontal and vertical mixing with other water masses and the interaction with the atmosphere.
Optimum multiparameter analysis of water masses is an extension of the classical thermohaline analysis. It based on the complex of sea water parameters including temperature and salinity, as well as nutrients, Redfield ratios, CFC, isotopes concentrations, and potential vorticity data.
Mathematically speaking, the OMP-analysis is a system of linear equations for each point of observation. In general, system matrix can be written as:
GX = d,
where G is the matrix of source water masses parameters, d is the vector of observations, X is the solution vector.
The distribution of the proportions of the source water masses along the sections can be a source of information about pathways of intermediate and deep waters. Time series of these parameters give an indication of the variability in the intermediate and deep circulation in a particular region.
The purpose of our study is a quantitative assessment of the characteristics of water masses at each point of the study area based on the optimal multiparameter analysis. The objective of our study is to determine long-term variability in all water masses of the deep layer of the North Atlantic.
Calculations were performed for 15 oceanographic sections made in the North Atlantic (24-65° N) from 1980 to 2004. We investigated the water masses below 500 m, where seasonal changes are insignificant. Nine major water masses were identified in order to study the structure of the North Atlantic Ocean, whose proportions were determined along the North Atlantic.
The result can be used to further fundamental research on structure and circulation of intermediate, deep and bottom waters of the oceans.