Refinement of Optimum Multiparameter approach for water mass analysis

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Optimum multiparameter (OMP) analysis is a method to determine how different mixing source water masses contribute to form the water sample under study. In fact, the optimal source water fractions are found when the residuals remaining between measurements and reconstructed mixed parameters are minimal. This implies that the interpretation of the residuals is quite crucial for the final result of the analysis. As a first attempt to refine the OMP procedure, an objective criterion to judge the residuals' acceptability is proposed and implemented. The influence of this refinement can be quite severe, as will be shown.

In classical OMP analysis every sampling point in the water field of interest is reconstructed individually. This means there is no mathematical control that translates the basic knowledge that the composition of one point in the ocean will probably not differ much from the composition of the neighbouring sampling point. As a consequence, measurement errors on each sampling point are fully propagated into the water fractions. Therefore, it seems worthwile to include this « constraint » in the OMP analysis as a second refinement of the original method. In order to achieve this, basis functions could be elaborated to describe the variations in source water fractions explicitly as a function of position (e.g. depth and latitude). This approach would furthermore have the advantage of lowering the number of parameters that need to be estimated, which increases the statistical significance and interpretability of the results.

The refined OMP analysis will be applied to several transect datasets. Special emphasis will be on those across the Southern Ocean.