A parametric method for water mass analysis applied to the Southern Ocean

A. DE BRAUWERE[1,2], S. H. M. JACQUET[1], F. DE RIDDER[1,2], F. DEHAIRS[1], R. PINTELON[2], J. SCHOUKENS[2] AND W. BAEYENS[1]

[1] Vrije Universiteit Brussel, Dept. Analytical and Environmental Chemistry, Brussels, Belgium; adebrauw@vub.ac.be

[2] Vrije Universiteit Brussel, Dept. Electricity and Instrumentation.

Mixing distributions of water masses in the ocean can be reconstructed by measuring conservative tracers on a grid and optimizing the mixing coefficients of the mixing water masses such that the observed patterns are well approximated. This is the fundamental idea of Optimum Multiparameter (OMP) analysis. Here a parametric variant of the OMP model is presented. It is based on the same basic assumptions but by parameterizing the unknown mixing fraction fields, the total number of unknowns to be estimated is greatly reduced. This results in a more robust and hence more interpretable model outcome.

The method (called POMP) is primarily used to reconstruct mixing coefficients for given water masses. This information can be used to distinguish between conservative and non-conservative processes causing the observed tracer field. For example, dissolved barium was investigated for conservativeness. In addition to the mixing coefficients, the water mass characteristics can also be optimized, widening the application to situations where the characteristics or the number of mixing water masses is not well known.

The possibilities of this parametric model are explored by applying it to several datasets from the Southern Ocean. For these specific examples, seasonal and spatial variability of water masses and their mixing patterns will be discussed.

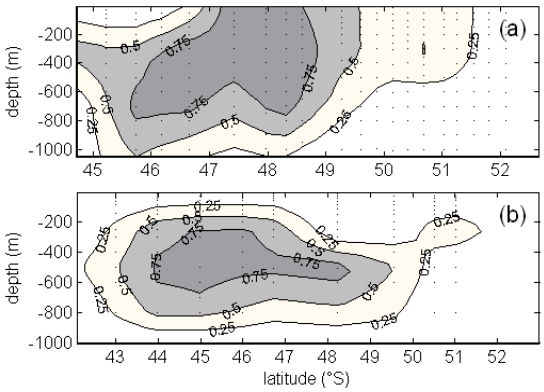

***Figure**: Mixing fractions for the Subantarctic Mode Water, computed along the WOCE SR3 transect (a) for an early spring situation, and (b) for a summer situation.*