Seasonal Variability of the Eastern and Western Mediterranean Circulation derived from historical data.

Pierre BRASSEUR[1] and Jean-Marie BECKERS[1]

GHER, University of LIEGE (**Belgium**)
[1]Research Assistant, National Fund for Scientific Research.

The Eastern and Western basins of the Mediterranean Sea have been the seat of multiple and intense - although fragmented in space and time - observing networks and hydrographic surveys, delivering a substantial amount of information about the general circulation.

In most cases, these data sets have been interpreted individually, in order to investigate regional processes, isolated mechanisms or local hydrographic regimes. The main objective of this study is to construct a unified data set, - using as many *in situ* observations as possible -, to analyse them globally and to extract the seasonal signal of the circulation consistent with the historical data.

The variational inverse method (BRASSEUR and HAUS, 1991) has been applied to reconstruct the three-dimensional temperature and salinity (or density) fields representative of the four seasons. The solutions are derived from a variational principle, taking into account the statistics of the observations to minimize the expected error on the fields. Additionally, a kinematic constraint is shown to be equivalent to anisotropic correlations between the data, as a result of the advection of the scalar properties by the geostrophic circulation.

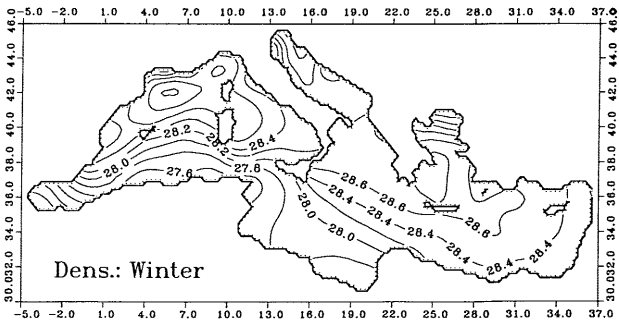

Fig. 1.- Surface density representative of the winter season.
Optimal solution produced by the variational inverse method.

At the seasonal scale, the distribution of the sations is relatively homogeneous and it is possible to observe correctly the seasonal signal in temperature and salinity. Heat and salt budgets are computed for the different water masses and the seasonal volume variations of the surface layer and intermediate water mass are represented.

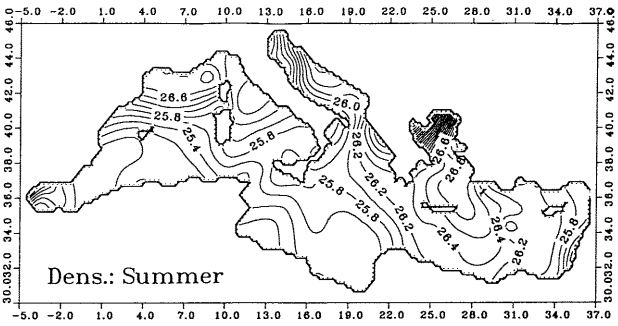

Fig. 2.- surface density representative of the summer season.
Optimal solution produced by the variational inverse method.

At the monthly scale, the stations are typically too sparse to reproduce a significant month-to-month variability from the observations only. Gaps between the data points must be filled in, using a realistic dynamical procedure to interpolate in space and time.

The assimilation of the results of the variational inverse method in the GHER primitive equation model (BECKERS, 1991) is tested using a very simple "restoring" scheme at the surface. The implementation of a more sophisticated procedure (derived from the Kalman filter scheme) is currently investigated.

REFERENCES

BRASSEUR P. & HAUS J., 1991.- Application of a 3-D variational inverse model to the analysis of ecohydrodynamic data in the Northern Bering and Southern Chukchi Seas. *Journal of Marine Systems*, 1, 383-401.

BECKERS J.M., 1991.- Application of a 3D model to the Western Mediterranean. *Journal of Marine Systems* 1, 315-332.