INVERSE MODELLING OF SALINITY-TEMPERATURE-DEPTH RELATIONSHIPS IN THE UPPER EASTERN NORTH ATLANTIC

F. Machín[1], J.L. Pelegrí[1], L. Herraiz[2], Á. Marrero-Díaz[3], J. Font[1], Á. Rodríguez-Santana[3]

[1] Institut de Ciéncies del Mar (CMIMA-CSIC), Passieg Maritim de la Barceloneta, 08003 Barcelona, Spain. fmachin@icm.csic.es.
[2] CSIRO Marine Research, University of Tasmania, GPO Box 1538, Hobart, Tasmania, 7001 Australia.
[3] Facultad de Ciencias del Mar, Universidad de Las Palmas de Gran Canaria, Campus Universitario de Tafira, 35017 Las Palmas de Gran Canaria, Spain.

We test the skill of a polynomial fit to reproduce the upper-ocean salinity in the eastern North Atlantic as a function of temperature and depth. A historical database is obtained after merging several datasets in the region to fill their respective gaps. The polynomial coefficients are estimated by solving an inverse model where we control both the size of the coefficients and of the residuals, and an ANOVA test is performed to determine the optimal degree of temperature and depth in the polynomial fit.. We run the inversion over datasets composed by data in the Main Box (12ºx12º), Quadrants, and Zones (2ºx2º). This allows us to perform a sensitivity study of the method and to assess the spatial variability of the coefficients. Quadrants are defined by applying a cluster analysis to objectively group Zones with similar oceanographic properties. The seasonality in the coefficients is also addressed using data both from the Main Box and the Quadrants. The seasonal coefficients typically do a better job at predicting the salinity than the annual ones. The zonal coefficients generally give the best results when retrieving the salinity, neutral density and geostrophic velocity. The error in predicting salinity does not exceed 0.086 psu in salinity, 0.06 kg m^{-3} in neutral density and 3 cm s^{-1} in geostrophic velocity. This work has been carried out in the framework of project CANOA, funded by the Spanish Ministry Education and Science, reference number CTM2005-00444/MAR.