



Methods for the reconstruction of vertical profiles from surface data: comparison of univariate/multivariate analyses and gravest empirical modes techniques.

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Different methods for the extrapolation of vertical profiles from sea surface measurements have been developed and tested. These methodologies, called Coupled Pattern Reconstruction (CPR, Buongiorno Nardelli and Santoleri, 2004) and multivariate EOF Reconstruction (mEOF-R, Buongiorno Nardelli and Santoleri, 2005) base on the multivariate analysis of the variability of vertical profiles from hydrographic data and on the hypothesis that only few modes are needed to explain most of the variance/covariance of the fields. The CPR and mEOF-R methods have been first applied and tested on several years of Conductivity-Temperature-Depth (CTD) measurements collected in the northern Mediterranean sea during the DYFAMED (DYnamique des Flux de mAtière en MEDiterranée) program, and in the northern Pacific during the HOT (Hawaii Ocean Time-series) program. The results have been compared with ad hoc climatologies, with results of previous similar univariate techniques and of the residual Gravest Empirical Mode technique (GEM, Mitchell et al. 2004), indicating the potential of these techniques in relation to the surface measurement accuracy. Successively, some tests have been performed using directly Topex/Poseidon altimeter data as input for the sea surface elevation in a selected area inside the Mediterranean sea (Cavalieri et al., 2004). At this step, a synthetic mean dynamic topography computed from drifters and altimeter data (Rio and Hernandez, 2003) was added to standard altimeter sea level anomalies to improve the estimate.