TIME DEPEDENT OPTIMAL MAPS OF THE POEM HYDROGRAPHIC SURVEYS OBTAINED THROUGH THE ADJOINT METHOD

A. BERGAMASCO[1] and P. MALANOTTE-RIZZOLI[2]

[1]Istituto Studio Dinamica Grandi Masse, C. N. R., Venezia, Italia
[2] Depart. of Earth, Atmospheric and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, USA

The GFDL primitive equation model in its fully time-dependent non linear version has been used in the Eastern Mediterranean together with its adjoint to find the model state optimaly consistent with the model dynamics, the prescribed climatology, and which is steady in time. We now have used the adjoint method in its fully time dependent form, i.e. assimilating the data at the time and at the spatial location they were collected. We have produced time-dependent optimal maps for the POEM general surveys of ON85, MA86, AS87 and ON91.

This means that, starting from a first guess initial condition given by the climatology for the corresponding month (season) the hydrographic data (temperature/salinity casts at standard depth levels) are assimilated at the time in which the hydrographic station was actually taken and at the location (latitude, longitude) of the station itself. Thus, the cost function is constructed in a time dependent manner following the time space trajectory of the research vessel(s) during the surveys in the forward integration of the model. The adjoint is then integrated backward in time in the usual manner to modify the first guess initial condition. The procedure is iterated until the cost function has decreased to an "acceptable" level, where the measure of success is assessed through the examination of the final data misfits residuals (BERGAMASCO *et al.*, 1993). Thus, a time-dependent optimal map is reconstructed consistent with primitive equation dynamics and the specific hydrographic survey. We have optimally mapped the POEM surveys (ON85 through ON91) with the exception of MA87 in which data are too sparse. These time-dependent optimal maps will quantify in a definitive manner the space scales of the sub-basin and mesoscale structures of the eastern Mediterranean, their persistence versus variabilities.

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