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Assimilation of biophysical observations into the E. Mediterranean ecosystem model

G. Triantafyllou, G. Korres, I. Hotteit, G. Petihakis, A. Pollani
Institute of Oceanography, HCMR (gt@ath.hcmr.gr)

Data assimilation have known tremendous progress in physical oceanography during the last few years and advanced assimilation techniques have been developed to tackle the specific problems. However, this area is still in its infancy in marine ecology, due to the high complexity of the ocean ecosystem, to its dependency on the hydrodynamical forcing (advection/diffusion of ecological quantities), and to its significant spatial and temporal variability. Furthermore, the ecosystem modeling requires coupling of two complex models: the physical model that describes the currents of the area, and the biochemical model that describes the interactions between the different ecological species, making the assimilation into these systems very challenging. Up today, most of the studies consider only the assimilation into one of the two models, assuming that the other model is perfect. However, data assimilation into one system may result in misalignments of the physical and biological fronts giving rise to spurious cross-frontal fluxes of biological quantities. Moreover, a perfect model assumption is far too optimistic and one may not obtain reliable estimates of the ecology if the ocean circulations are not well simulated by the physical model. It is therefore necessary to constrain both models simultaneously with physical and biological observations in order to improve their behaviors and to assure a consistency between their respective analyses. The assimilatiom scheme was developed in the framework of the MFSTEP, while focusing on: the effectiveness of a suboptimal Kalman filter in simultaneously assimilating physical and biological data into a coupled ecosystem model; the capacity of an observing system based on one observed biological variable only (usually the ocean colour related to the model through chlorophyll); the control of numerous non-observed biological variables through the multivariate character of the assimilation scheme; and the effect of the physical data on the ecology.