

**Nitrogen budget in the Eastern Mediterranean Sea:
results from a coupled 3D hydrodynamic-biological model**

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The principal goal of the POEM 2 project is the interaction of the bio-geochemical cycles with the physical processes in the Mediterranean Sea. For this purpose a model was implemented, (CRISE *et al.*, 1992). Coupling the previously developed hydrodynamics (MALANOTTE-RIZZOLI and BERGAMASCO, 1989; PINARDI and NAVARRA, 1992) with a trophic model. In particular, the aim of this work is the discussion of the results of a numerical experiment devoted to the simulation of a simplified conservative nitrogen cycle. For this simulation, the Eastern Mediterranean is a well suited testbed because of the lack of significant nutrient sources and the Gibraltar effects have little influence on the eastern basins. Our model encompasses the whole Mediterranean and is based on a Bryan and Cox primitive equation eddy resolving model with a 1/4 degree spatial resolution and 16 levels in the vertical coordinate. This model is forced by monthly Hellermann wind stresses and is initialized by the Levitus climatological T-S data.

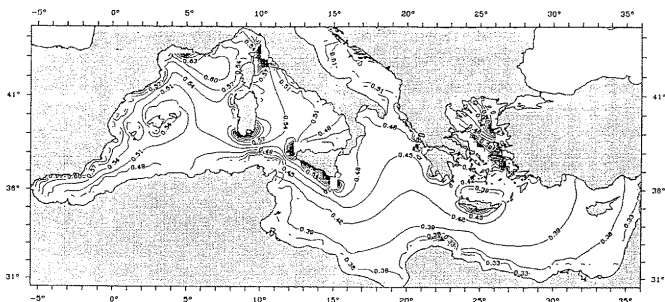


Fig. 1.- Nutrient distribution (mg at N/m^3) at 50 meter depth in April

The biological model takes into account non-passive advection-diffusion of nitrogen, phytoplankton and detritus on the same spatial grid of the hydrodynamic part, giving a good horizontal resolution. The considered limiting factors for phytoplankton growth are nitrogen concentration, downward irradiance and temperature. Climatic data are used to initialize the biochemical fields; the daily irradiance and photoperiod are used as forcing terms for the biochemical model whereas the temperature and the advection evolve according to the hydrodynamic model.

The numerical results show a low nutrient concentration in the upper layer with an increasing concentration through the depth. The minimum is found in the Eastern Mediterranean while higher values appear in convergence areas, in good agreement with the known phenomenology. A snapshot of the model regarding nutrients is shown in fig. 1. An evaluation of nitrogen annual fluxes for Sicily Channel is estimated and comparisons with the figures given by BETHOUX (1981) are given.

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