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Ecosystem modeling of the Mediteranean Sea. A study of the variability of N. Aegean using a very high resolution ecosystem model

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The Mediterranean Sea can be regarded as a particularly sensitive area both to climatic changes and anthropogenic pressure due to its semi-enclosed nature and intense human exploitation.

Modeling the ecosystem functioning provides a valuable tool to understand its variability and predict the marine environment status under various conditions, which is essential for the management of marines resources.

In the framework of SESAME (Southern European Seas: Assessing and Modelling Ecosystem changes) project, a three-dimensional coupled biogeochemical/hydrodynamic model based on ERSEM/POM, of $1/10^0$ resolution ($\sim$10Km) is implemented in the Mediterranean. The same model is downscaled through one-way nesting at a higher resolution ($1/60^0$ resolution $\sim$1.5Km) in the North Aegean Sea that links the Mediterranean to the more eutrophic Black Sea through Dardanelles straits. The significant input of low-salinity nutrient rich waters of Black Sea origin constitutes a major driving force for the North Aegean ecosystem, contributing along with riverine inputs to its more productive characteristics. A simulation of the 2002-2003 period was performed in order to evaluate the coupled models performance in simulating the basic features of the ecosystem and circulation dynamics. High-resolution atmospheric forcing (6-hour, $1/4^0$), provided by the HCMR "POSEIDON" operational forecast model was employed. All major Mediterranean (Po, Rhone, Nile, Ebro) and

North Aegean rivers are represented while the employed riverine nutrient inputs are obtained from available data and model simulations of the Mediterranean drainage basin, performed within SESAME project. The Dardanelles water exchange regime was parameterized by employing a two-layer (inflow of Black Sea Water and outflow of Aegean water) open boundary condition with prescribed transport rates and salinity. Monthly composites of remotely sensed chlorophyll-a (MODIS) at 4km resolution for the 2003 period were used to calibrate the coupled model. Ecosystem predictions are consistent with the observed characteristics of the modeled system, reproducing the main features of the seasonal and spatial variability, the spatial evolution of N/P ratio, the increased chlorophyll and productivity rates in river influenced, shallow coastal areas and with the Dardanelles plume pathway.