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A coastal management tool using ecological modeling and data assimilation in a semi-enclosed gulf of Greece

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The ecosystem of Pagasitikos gulf is explored through the development and application of 3D complex bio-physical (POM&ERSEM) model and data assimilation techniques in the framework of the Data Integration System for Eutrophication Assessment in Coastal Waters (INSEA) project. The aim of this work is to produce a coastal management tool by investigating the performance of sequential assimilation using Kalman filters with high resolution ocean models. This was accomplished with the use of two advanced Kalman filters: the singular evolutive extended Kalman (SEEK) filter .....(Pham et al., 1997) and its ensemble-based variant, called SEIK filter .....(Triantafyllou et al., 2003). After a model spin up period of ten years to reach a quasi steady state, the results from an annual simulation are presented. Emphasis is given in the description of the spatial and temporal variability of the ecosystem variables as well as in the relationship between physical forcing and the evolution of the ecosystem along with other factors affecting the nutrient cycling and primary production. A cost function is used as validation method for the comparison of model results with field data. The estimated annual primary and bacterial production are found to be in the range of the reported values. Simulation results are in good agreement with in situ data illustrating the role of data assimilation in determining the evolution and variability of the ecosystem as well as pointing out the significance of inputs in the functioning of this sensitive ecosystem, highlighting thus the potential utility of the system as an operational tool to support environmental management decisions.

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