



3D modelling of the Black Sea ecosystem

A. Capet (1), M. Gregoire (2), J-M Beckers (3), P. Joassin (4), J. Naithani (5), and K. Soetaert (6)

(1) MARE Centre, B6c Sart-Tilman, Liege University, 4000 Liège, Belgium, arthur.capet@student.ulg.ac.be, (2) MARE Centre, B6c Sart-Tilman, Liege University, 4000 Liège, Belgium, mgregoire@ulg.ac.be, (3) MARE Centre, B6c Sart-Tilman, Liege University, 4000 Liège, Belgium, JM.Beckers@ulg.ac.be, (4) MARE Centre, B6c Sart-Tilman, Liege University, 4000 Liège, Belgium, Pascal.Joassin@student.ulg.ac.be, (5) MARE Centre, B6c Sart-Tilman, Liege University, 4000 Liège, Belgium, jnaithani@ulg.ac.be, (6) NIOO-CEME, Yerseke, The Netherlands, K.Soetaert@nioo.knaw.nl

A coupled physical-biogeochemical model has been developed to simulate the ecosystem of the Black Sea at the end of the 80's when eutrophication and invasion by gelatinous organisms seriously affected the stability and dynamics of the system. The biogeochemical model describes the cycle of carbon, nitrogen, silicate, oxygen and phosphorus through the foodweb from bacteria to gelatinous carnivores and explicitly represents processes in the anoxic layer down to the bottom. For calibration and analyses purposes, the coupled model has first been run in 1D at several places in the Black Sea. The biogeochemical model involves some hundred parameters which have been first calibrated by hand using published values. Then, an identifiability analysis has been performed in order to determine a subset of 15 identifiable parameters. An automatic calibration subroutine has been used to fine tune these parameters. In 1D, the model solution exhibits a complex dynamics with several years of transient adjustment. This complexity is imparted by the explicit modelling of top predators. The model has been calibrated and validated using a large set of data available in the Black Sea TU Ocean Base. The calibrated biogeochemical model is implemented in a 3D hydrodynamical model of the Black Sea. Results of these 3D simulations will be presented and compared with maps of in-situ data reconstructed from available data base using the software DIVA (Data Interpolation and Variational analysis).