The GHER and NEMO models in the CMEMS Black Sea MFC biogeochemical forecasts

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Inside the Modeling of Aquatic Systems Black Sea Monitoring and Forecasting Center (CMEMS BS-MFC), the daily biogeochemical forecasts and the multidecadal analysis are computed using the BiogeochemicAl Model for Hypoxic and Benthic Influenced areas (BAMHBI) (Gregoire et al. 2008, 2011, Capet et al., 2016).

BAMHBI describes the food web from bacteria to gelatinous carnivores through 24 state variables, several plankton functional types and an explicit representation of the bacterial loop. The model simulates oxygen, nitrogen, silicate and carbon cycling and explicitly represents processes in the anoxic layer, so that processes in the upper oxygenated layer are fully coupled with anaerobic processes in the deep waters, allowing to perform long term simulations.

Historically, BAMHBI has first been coupled with the GHER hydrodynamical model. For the new CMEMS versions, it is coupled with the NEMO model. Important differences between the 2 circulation models include different vertical discretizations, different numerical schemes, different parameterizations (in particular concerning vertical diffusion) and different treatments of the boundary conditions at the surface and the Bosphorus Strait.

Results of the two coupled systems are compared for both physical and biogeochemical variables. In particular, the shape of the chlorophyll profile, and the depth of the chlorophyll maximum are analyzed and compared with ARGO observations.