The New Copernicus Black Sea Monitoring and Forecasting Centre: Towards Black Sea Operational Oceanography

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Abstract. The aim is to present the new Black Sea Monitoring and Forecasting Centre (BS-MFC) which was established in April 2016 as a part of the Copernicus Marine Environment Monitoring Service (CMEMS). The objective of BS-MFC is, starting from October 2016, to release regularly information about the actual state and 10-days forecast of the Black Sea physical and biological parameters. The good quality of the product is ensured by continuous comparison with data from in-situ and satellite measurements. The analysis and forecast system consists of 3 modules: 1) a physical model BS-currents, based on NEMO (Nucleus for European Modelling of the Ocean): 2) a biogeochemical model BS-biogeochemistry, based on is the Biogeochemical Model for Hypoxic and Benthic Influenced areas (BAMHBI); 3) a wave model BS-Waves based on WAM will be coupled with the physical model at later stage.

The Black Sea domain is resolved with $1/27° \times 1/36°$ horizontal resolution ($\sim$ 3 km) and 31 z-levels with partial steps based on the GEBCO bathymetry data. The BS-currents solves the system of differential equations for temperature, salinity, currents and sea surface height. It assimilates in near-real time data from Argo profilers, SST and SSH from satellite observations using 3Dvar assimilation technique. The BS-biogeochemistry describes the food web from bacteria to gelatinous carnivores through 24 state variables including three groups of phytoplankton: diatoms, small phototrophic flagellates and dinoflagellates, two zooplankton groups: micro- and mesozooplankton, two groups of gelatinous zooplankton: the omnivorous and carnivorous forms, an explicit representation of the bacterial loop: bacteria, labile and semi-labile dissolved organic matter, particulate organic matter. The model simulates oxygen, nitrogen, silicate and carbon cycling.

The described system produces on a daily bases 10-day forecasts, 3-days analyses and 1-day simulation. Once a week, the system is run 15-day in the past in analysis mode to compute the new optimal initial condition

for the forecast cycle. The system produces hourly and daily means for temperature, salinity, currents and sea surface height, and the results are visualized online. Model validation against satellite observations for SST and in-situ ARGO measurements is also visible online.