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Modelling physical and biogeochemical state of the Mediterranean Sea under contemporary and future climate

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A validated 3D coupled transport-biogeochemical model is used to assess the impact of future climatic and management scenarios on biogeochemical and ecological properties of the Mediterranean Sea. Results are discussed in term of temporal and spatial distribution of parameters and indicators related to the carbonate system and the cycles of carbon and inorganic nutrients through dissolved and particulate phases, as simulated by a multi nutrient multi plankton numerical model under current and future conditions. Simulations span the period 2000-2040 and are performed by forcing a three-dimensional off-line coupled eco-hydrodynamical model (BFM and OPA-tracer model, http://bfm-community.eu/) with marine circulation fields produced by ad hoc implementation of the NEMO modelling system and with river input of nutrient and freshwater computed in recent European fp7 projects.

The model properly describes available experimental information on contemporary seasonal dynamic and spatial distribution at the basin and sub-basin scale of major biogeochemical parameters, as well as primary production and carbon fluxes at the air-ocean interface.

Model projections suggest that future Mediterranean sea will be globally warmer, more productive, and more acidic, but with significant space variability. The relative importance of different biotic and abiotic parameters in defining such a change is explored through several numerical experiments.

Potential implications in terms of ecological and higher trophic level organisms dynamics are explored as well, by integrating niche properties of selected organisms and suggestions provided by food web models.