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Mediterranean Sea ecosystem status under contemporary and future climate

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An ensemble of atmospheric, physical biogeochemical and ecological model has been used to assess the impact of future climatic and management scenarios on biogeochemical and ecological properties of the Mediterranean Sea. Results are discussed in terms 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 climate conditions. Simulations span the period 1990-2100 and are performed by forcing a three-dimensional coupled eco-hydrodynamic model (BFM and OGSTM, NEMO modelling systems) with river input of nutrient and freshwater computed in recent European 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 as a whole warmer, more productive, and more acidic, but with significant space variability. The temperature driven increase in gross primary production will be nearly compensated by an increase in ecosystem respiration with the final result of a slight reduction in system biomass and in increase in dissolved organic matter. These projections are then used to drive habitat suitability models for biogenic habitats (Posidonia oceanica seagrass, coralligenous formations, maerl beds) as well as to evaluate impact of changes in extreme event dynamics (heat waves) on selected species of ecological or economical values (red coral, clams, mussels) and on selected ecosystem services (carbon sequestration)