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Impacts of climate-driven changes on coastal lagoon ecosystem and related good and services

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Effects of IPCC climate change scenarios on a temperate coastal lagoon ecosystem, the lagoon of Venice (Italy), along with goods and services provided by this ecosystem are assessed though a downscaling experiment linking regional atmospheric model to local hydrodynamical, biogeochemical, ecosystem and target species population dynamic models. Simulations of spatio-temporal dynamics of biogeochemical properties provide evidence of significant impacts of climate change. Under both the A2 and B2 scenarios we observe a modification of the seasonal precipitation pattern which affects the timing of nutrient inputs to the lagoon and causes a reduction in plankton productivity. Simulations indicate that this changes propagate –along the food web through a multi-path cascade and that overall ecosystem good and services resulting from climatic scenarios significantly differ depending on the dynamics of the extremes (yearly maximum) values.
Changes in the nutrient load maximum discharge (scenario A2) favors primary producers that have higher maximum values (peaks) that propagate up in the food web to groups directly related to the grazing food chain. Conversely, small modifications of the timing of the nutrient peaks (as in B2 scenario) implies less exploitation of nutrients by primary producers due to temperature limitations and the enhancement of the groups in the food web that are more related to detritus-based food chain. This implies significant differences on on fisheries landings in future scenarios, even assuming same fishing effort.. Ecological indicators highlighted also divergent changes in food web biodiversity and complexity in the two future scenarios. Simulations also shows that economic activity directly related to target species, such as clam aquaculture activity will suffer , and point to the need for management policies to mitigate the adverse effects of climate change.