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TITLE: Modelling climate change impacts on nutrients and primary production in coastal waters

AUTHOR: ['Marco Pesce', 'Andrea Critto', 'Silvia Torresan', 'Elisa Giubilato', 'Monia Santini', 'Alberto Zirino', 'Wei Ouyang', 'Antonio Marcomini']

ABSTRACT:

There is high confidence that the anthropogenic increase of atmospheric greenhouse gases (GHGs) is causing modifications in the Earth's climate. Coastal waterbodies such as estuaries, bays and lagoons are among those most affected by the ongoing changes in climate. Being located at the land-sea interface, such waterbodies are subjected to the combined changes in the physical-chemical processes of atmosphere, upstream land and coastal waters. Particularly, climate change is expected to alter phytoplankton communities by changing their environmental drivers (especially climate-related), thus exacerbating the symptoms of eutrophication events, such as hypoxia, harmful algal blooms (HAB) and loss of habitat. A better understanding of the links between climate-related drivers and phytoplankton is therefore necessary for projecting climate change impacts on aquatic ecosystems. Here we present the case study of the Zero river basin in Italy, one of the main contributors of freshwater and nutrient to the salt-marsh Palude di Cona, a coastal waterbody belonging to the lagoon of Venice. To project the impacts of climate change on freshwater inputs, nutrient loadings and their effects on the phytoplankton community of the receiving waterbody, we formulated and applied an integrated modelling approach made of: climate simulations derived by coupling a General Circulation Model (GCM) and a Regional Climate Model (RCM) under alternative emission scenarios, the hydrological model Soil and Water Assessment Tool (SWAT) and the ecological model AQUATOX. Climate projections point out an increase of precipitations in the winter period and a decrease in the summer months, while temperature shows a significant increase over the whole year. Water discharge and nutrient loads simulated by SWAT show a tendency to increase (decrease) in the winter (summer) period. AQUATOX projects changes in the concentration of nutrients in the salt-marsh Palude di Cona, and variations in the biomass and species of the phytoplankton community.

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