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Downscaling of climate model projections: effects of ocean warming in living organisms in the Rías Baixas

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Abstract

Climate change is expected to have a significant environmental impact affecting primary production and many species with critical ecological and economic effects. As climate change effects will not be the same everywhere, regional studies are necessary to assess the impact of climate change and manage mitigation and adaptation strategies. The Rías Baixas (NW Iberian Peninsula) are four incised valleys located on the northern limit of the Eastern North Atlantic Upwelling system. These rias are areas of high productivity, supporting up to 40% of the European and up to 15% of the world aquaculture production of mussels. Moreover, the rias are acting as contemporary climatic refugia for many habitat-forming macroalgae that provide structure, shelter, and food to many accompanying species that form the ecological community. Numerical models have shown to be one of the best tools to reproduce reality with enough accuracy and to provide data that would be very difficult to obtain through surveys, or even impossible, such as future projections. However, the databases and climate models available have a too coarse spatial resolution to capture detail inside the Rías Baixas adequately. In this study, we use an integrated model, Delft3D_Flow, to perform a downscaling of climate models to study the possible effects of climate change on the mussels productivity and the future geographical distribution of habitat-forming macroalgae. Ocean warming will increase time during which mussels are subjected to water temperature above the maximum value of their optimum growth range. Therefore, it is expected that mussel productivity will decrease. In addition, ocean warming will cause the extinction of macroalgae such as *Himantalia elongata*, and favour the settlement of macroalgae with a higher thermal tolerance limit, as *Bifurcaria Bifurcata*, leading to changes in the ecological community.

Keywords

Numerical model, Downscaling, Climate change, RCP8.5