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Upscaling the impact of varying macro-benthic activity from local diagenesis to biogeochemical cycles in the frame of Black Sea northwestern shelf hypoxia dynamics.

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Deoxygenation is among the most widespread deleterious anthropogenically induced pressure on marine organisms. In the coastal area, the occurrence and expansion of Oxygen Minimum Zones (OMZs) result from the combined action of climate warming that reinforces the stratification (i.e. stronger and longer stratification, lower solubility of oxygen) and anthropogenic eutrophication that enhances the amount of organic matter to remineralize. In particular, those drivers induced seasonal hypoxic events in the northwestern shelf of the Black Sea during the past decades.

The BENTHOX project is targeted towards the understanding of marine coastal hypoxia and its consequences on benthic-pelagic exchanges, diagenesis and ecosystem functioning. Since the benthic compartment is a key player in biogeochemical coastal dynamics (and the occurrence of coastal OMZs, in particular) BENTHOX aims, among others, at 1) resolving the impact of bottom hypoxia on the distribution and activity of benthic organisms and 2) upscaling the effect of varying macrobenthic activity from local diagenesis to biogeochemical cycles at the scale of shelf.

Benthic-pelagic coupling is explicitly represented in the coupled 3D, basin-wide, NEMO- BAMHBI model through a meta-model approach, ie. user transfer function to mimic the behavior of the detailed OMEXDIA diagenetic model. Macrobenthos activities are represented in this model in terms of bioturbation and bioirrigation. Using a 1D framework, we first illustrate the impact of altered macrobenthic activities on a coastal water-column biogeochemical dynamics, for various seasonal scenario of hypoxia intensity. We then discuss, on the basis of sensitivity analyses, the optimal approach to upscale the current knowledge on macrobenthic spatial distribution in the 3D modelling framework.