Impact of the sea level rise on the seabed morphology of the Belgian Continental Shelf

Stéphanie Ponsar, Geneviève Lacroix and Dries Van den Eynde

The sea level rise induces changes on tidal currents, which, in turn, affect the transport and concentration of sediments. On one hand, these changes in sediment concentration have an impact on biological parameters such as the optical attenuation coefficient. On the other hand, changes in sediment transport modify the seabed morphology. These morphological changes might affect the water currents and the larval transport. So, changes in sediment transport and in the physical habitat are intertwined. As a result, when both sediment transport and sea level rise are considered, the water currents are modified in two ways: tidal currents are changed by the sea level rise and the changes in seabed morphology due to sediment transport modify the currents. This presentation focuses on the impact of the sea level rise on tidal currents and on how in turn morphological changes affect the currents.

Simulations of the impact of sea level rise are carried out on the Belgian Continental Shelf using the hydrodynamic component and the sediment module of the COHERENS model (http://odnature.naturalsciences.be/coherens/) [Luyten, 2019]. Sea level rise is represented by a bathymetric change of the corresponding value. Two values of sea level rise are considered: the first one is of 85cm and is based on the IPCC RCP 8.5 scenario, and the second one is a less realistic extreme value of 295cm. Based on the meteorological forcing of the regional climate model ALARO of the Royal Belgian Meteorological Institute, the model is run for six storms occurring in the period 2070-2099 with a time resolution of 5 minutes and during a time frame of ten days. The spatial resolution is of about 825 m in longitude and 772 m in latitude. In the vertical, the model is run using 20 $\boldsymbol{\sigma}$-levels.

Three series of simulations are carried out. The first one is run without meteo and without sediments to assess the impact of changes in sea level rise on tidal currents. In the second one, the sediment module is switched on to identify the impact of sea level rise on the morphology of the seabed and the feedback on the currents. In the third series of simulations, the impact of the wind forcing on sediment transport is taken into account.