THREE-DIMENSIONAL MODELLING OF THE SOUTHERN BIGHT OF THE NORTH SEA: FIRST RESULTS AND PERSPECTIVES

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GOAL OF INVESTIGATION

In the frame of the Brain FaCE-It project (Functional biodiversity in a Changing sedimentary Environment: Implications for biogeochemistry and food webs in a managerial setting), the impact of fining and hardening resulting from dredging and wind farms installation on the sediment grain size distribution has to be assessed at the scale of the Southern Bight of the North Sea (SBNS) with a particular focus on the Belgian Coastal Zone (BCZ).

This poster presents the implementation of a 3D hydrodynamical Regional Ocean Modeling System (ROMS), COAWST version, (fig.1) to simulate the hydrodynamics and sediment transport in the SBNS.

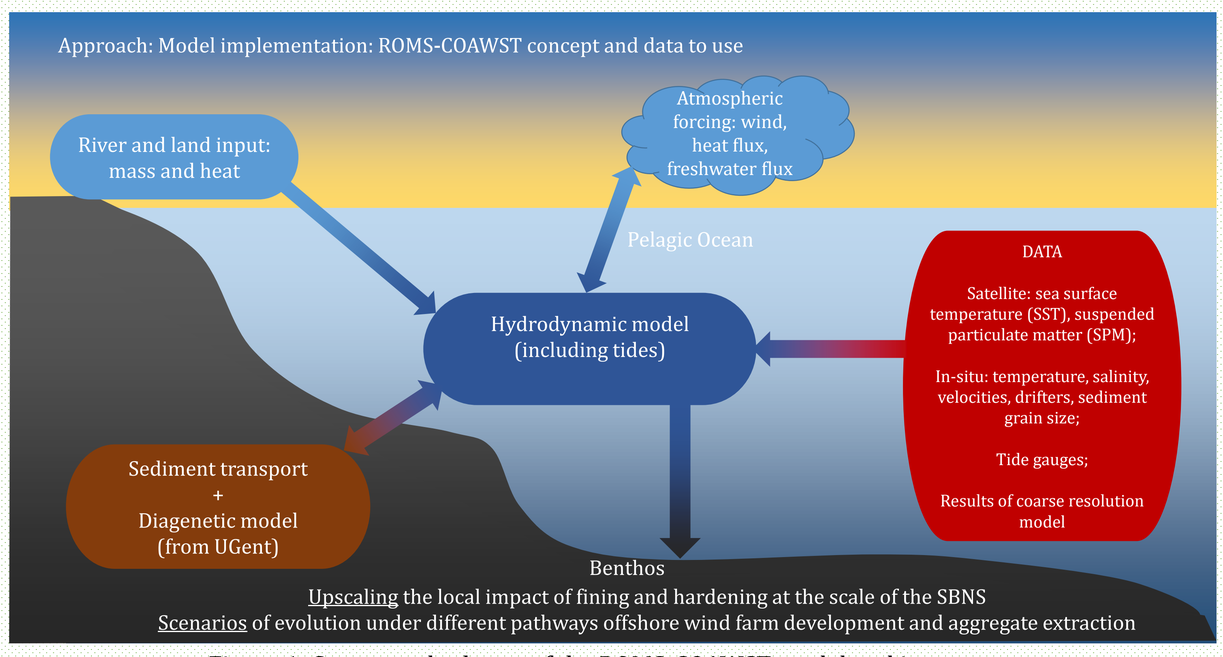

Figure 1. Conceptual scheme of the ROMS-COAWST model and input parameters.

GRID AND NESTING

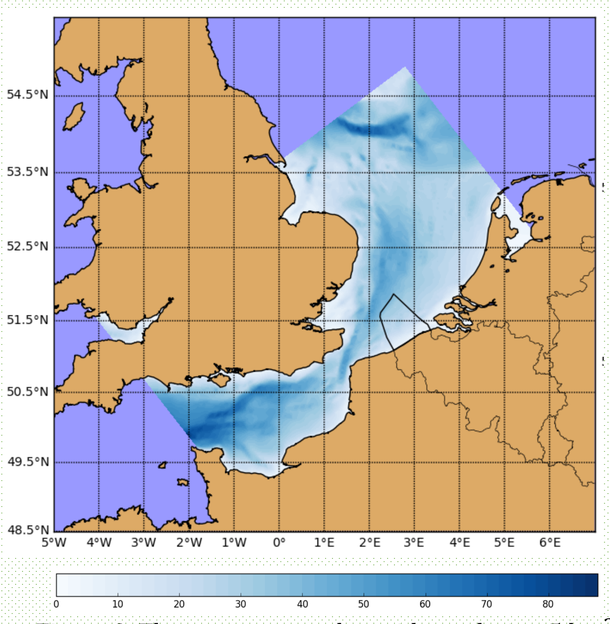

Figure 2. The new rectangular grid, resolution 5 km^2.

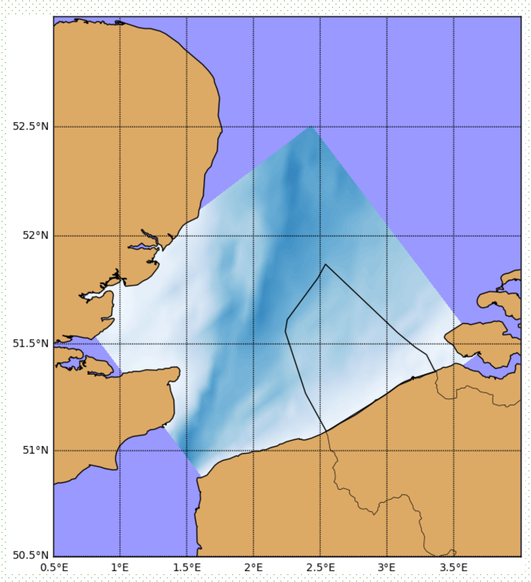

Figure3. The nested grid, resolution is 1 km^2. The depth scale is the same as for the fig.2.

Due to poor numerical stability and long time of computations, the previously constructed spherical grid was rejected in prior to the new fast and relatively stable rectangular grid (fig.2) with a resolution of 5 km^2. In order to reach the requested resolution, the nested grid with the resolution of 1 km^2 was implemented (fig.3). The next step will be nesting of the grid with the resolution of 200 m^2.

INTERANNUAL SIMULATION (9 YEARS) AND RESULTS VALIDATION

In order to question model's stability, 9 years run was conducted. The model was forced at the open boundaries with Copernicus Marine Environment Monitoring Service data, and at the surface with ECMWF data. Tidal runs used data from TPXO tidal model.

Sea surface temperature (SST) averaged at the surface for tidal and non-tidal interannual runs was compared with satellite temperature. The result shows significant similarity between the tidal run and the satellite data (fig.4)

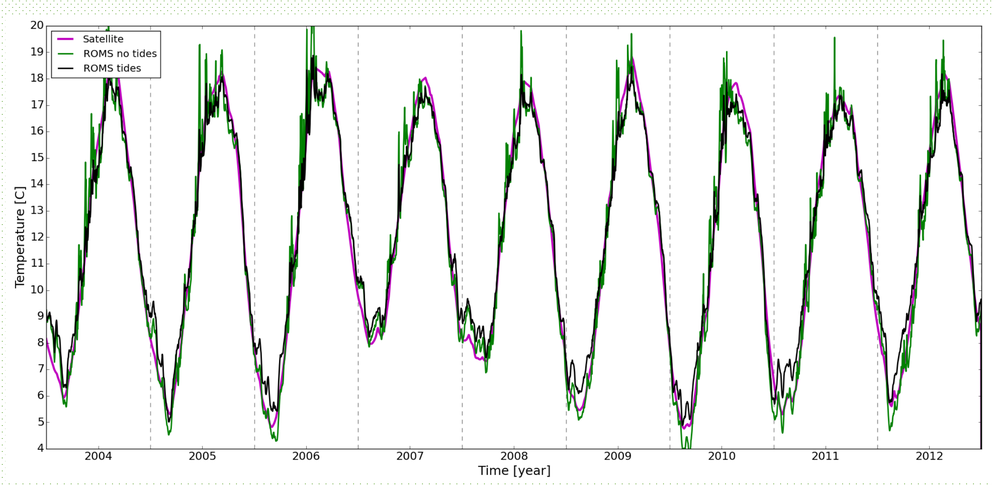

Figure 4. Comparison of interannual surface averaged SST from non-tidal (green) and tidal (black) simulations with the satellite data (purple).

Distribution of current velocities and directions was compared for the particular term 15th April – 6th May 2013 with glider data (Van Lancker, 2015) for non-tidal and tidal runs (fig.5). Direction of currents and its distribution from the tidal run is slightly different from the glider data, and completely different in case of non-tidal, that again shows importance of taking tides into account during the modelling of SNBS.

Tidal elevation in the model has a clear pattern and it is hard to compare it with the glider data (fig.6). The additional comparison with the tidal gauge will be done the next.

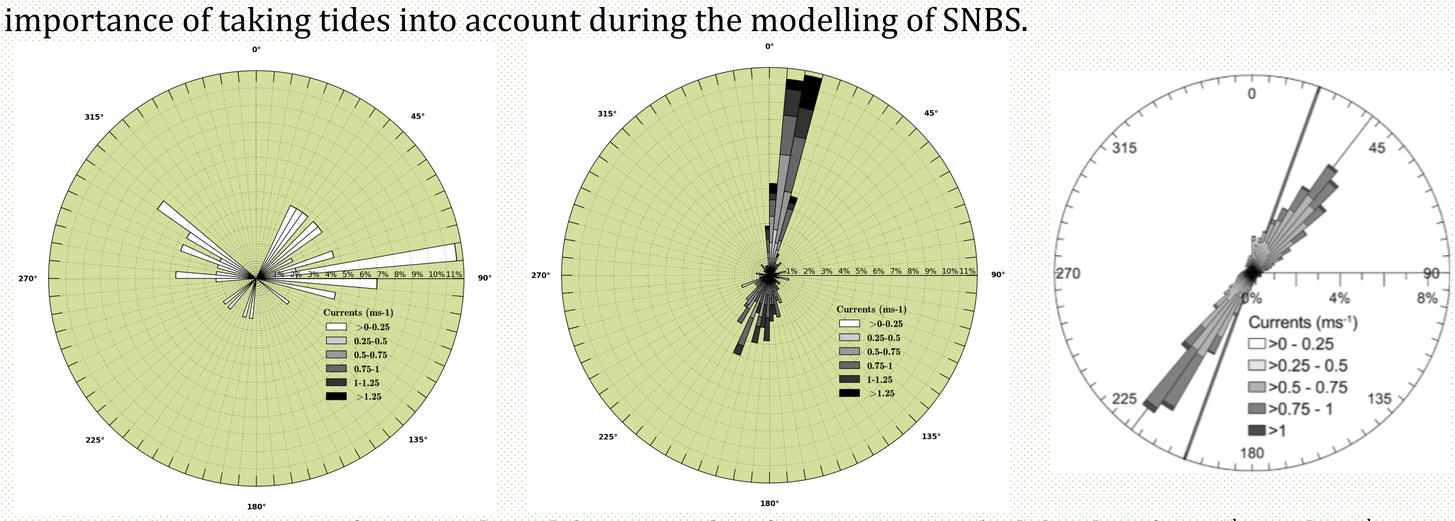

Figure 5. Comparison of magnitude and direction of surface currents with glider data for 15th April – 6th May 2013. 1st circle – non-tidal simulation, 2nd circle – tidal simulation, 3rd circle – glider data (Van Lancker, 2015).

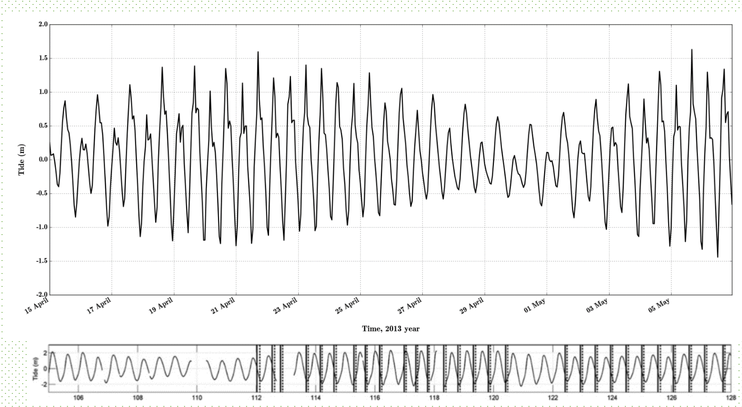

Figure 6. Comparison of tidal elevations with glider data for 15th April – 6th May 2013. Upper plot – tidal simulation, lower – glider data (Van Lancker, 2015).

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This study was funded by the Belgian Federal Science Policy Office (BELSPO).

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