Integrating the land-ocean aquatic continuum into a regional shelf sea model

Puthan Purayil Saheed[1], Lacroix Geneviève[2], Regnier Pierre[3], Arndt Sandra[3] and Van De Velde Sebastiaan J.[2]

[1] Operational Directorate Natural Environment, Royal Belgian Institute of Natural Sicences, Vautierstraat 29, 1000 Brussel
E-mail: sputhanpurayil@naturalsciences.be

[2] Operational Directorate Natural Environment, Royal Belgian Institute of Natural Sciences, Vautierstraat 29, 1000 Brussel, Belgium

[3] Department of Geoscience, Environment & Society, Université Libre de Bruxelles, Brussels, Belgium

Coastal oceans are important parts of the global carbon cycle. Depending on their health status, they can be net sources or sinks of important greenhouse gases (GHG) such as carbon dioxide or nitrous oxide. However, they are integral part of the land-ocean aquatic continuum (LOAC) and quantifying coastal GHG budget, as well as their response to projected global change, requires the consideration of the entire aquatic continuum from streams to the ocean. Yet, dynamically coupled models that cover the entire land-ocean aquatic continuum (LOAC) do not yet exist. Here we present the development of a boundless model that integrates the coastal ocean from shelf to its surrounding river-catchment. The model is the coupling a 3D shelf sea model (COHERENS) with a 1D estuarine model (the carbon generic estuarine model, CGEM). The integration of both models will allow the simulation of hydrodynamics and biogeochemistry along the LOAC. In addition, a future addition of a 1D sedimentary component will allow this boundless model to provide a source-to-sink assessment of the coastal ecosystem response to changes in (amongst others) land-use/management, atmospheric composition, and climate. This novel, boundless model will be used to establish an integrated carbon and greenhouse gas budget for the North Sea LOAC.

Keywords
Modeling; Coastal Oceans; Biogeochemistry; COHERENS; CGEM