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Development of an interdisciplinary model cluster for tidal water environments

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Global climate change has a high potential to influence both the persistence and the transport pathways of water masses and its constituents in tidal waters and estuaries. These processes are linked through dispersion processes, thus directly influencing the sediment and solid suspend matter budgets, and thus the river morphology. Furthermore, the hydrologic regime has an impact on the transport of nutrients, phytoplankton, suspended matter, and temperature that determine the oxygen content within water masses, which is a major parameter describing the water quality.
This project aims at the implementation of a so-called (numerical) model cluster in tidal waters, which includes the model compartments hydrodynamics, morphology and ecology. For the implementation of this cluster it is required to continue with the integration of different models that work in a wide range of spatial and temporal scales. The model cluster is thus suggested to lead to a more precise knowledge of the feedback processes between the single interdisciplinary model compartments. In addition to field measurements this model cluster will provide a complementary scientific basis required to address a spectrum of research questions concerning the integral management of estuaries within the Federal Institute of Hydrology (BfG, Germany). This will in particular include aspects like sediment and water quality management as well as adaptation strategies to climate change.
The core of the model cluster will consist of the 3D-hydrodynamic model Delft3D (Roelvink and van Banning, 1994), long-term hydrodynamics in the estuaries are simulated with the Hamburg Shelf Ocean Model HAMSOM (Backhaus, 1983; Hein et al., 2012). The simulation results will be compared with the unstructured grid based SELFE model (Zhang and Bapista, 2008). The additional coupling of the BfG-developed 1D-water quality model QSim (Kirchesch and Schöl, 1999; Hein et al., 2011) with the morphological/hydrodynamic models is an important step towards an integrated and interdisciplinary model cluster for future sediment management in estuaries.

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