



Validating a hydrodynamic framework for long-term modelling of the German Bight

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The intention of the “AufMod” project is to set up a modelling framework for questions concerning the large-scale, long-term morphodynamic evolution of the German Bight. First a hydrodynamic model has been set up which includes the entire North Sea and a sophisticated representation of the German Bight. In a second step, simulations of sediment transport and morphodynamic changes will be processed. This paper deals with the calibration and validation process for the hydrodynamic model in detail.

The starting point for “AufMod” was the aim to better understand the morphodynamic processes in the German Bight. Changes in bottom topography need to be predicted to ensure a safe and easy transport through the German waterways leading to ports at the German coast such as Hamburg and Bremerhaven. Within “AufMod” this question is addressed through a combined effort of gaining a comprehensive sedimentological and bathymetric data set as well as running different numerical models.

The model is based on the numerical method UnTRIM (Casulli and Zanolli, 2002). The model uses an unstructured grid in the horizontal to provide a good representation of the complex topography. The spatial resolution increases from about 20 km in the North Sea to 20 m within the estuaries. The model forcing represents conditions for the year 2006 and consists of wind stress at the surface, water level elevation and salinity at the open boundaries as well as freshwater inflows. Temperature is not taken into account.

For the model validation, there exists a large number of over 40 hydrodynamic monitoring stations which are used to compare modelled and measured data. The calibration process consists of adapting the tidal components at the open boundaries following the approach of Pluess (2003). The validation process includes the analysis of tidal components of water level elevation and current values as well as an analysis of tidal characteristic values, e.g. tidal low and high water. Based on these numerical measures, the representation of the underlying physics is quantified by using a skill score.

The overall hydrodynamic structure is represented well by the model and will be starting point for the following morphodynamic experiments.

Literature

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