

A first step towards SPM transport modeling in the Dutch Wadden Sea

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It has been known since long that fine suspended particle matter (SPM) is transported into the Wadden Sea from the adjacent North Sea through the Marsdiep inlet (Postma, 1961). The SPM flux through this inlet has been measured through NIOZ ferry measurements, and it has been estimated to be in the order of 5-10 Mton/year (Nauw, 2009). On the other hand, no observational information is available for the other major inlets of the Western Wadden Sea, and hence, it is completely unknown if SPM is later partly exported out of the Wadden Sea. The final aim of this work is to model numerically the SPM transport in the Dutch Wadden Sea region to determine the fate of the SPM entering here.

Although several mechanisms play a role in the transport of SPM (notably tidal asymmetry), it has been suggested that density-driven circulation across the tidal inlets is a dominant process importing SPM into the Wadden Sea (Burchard et al. 2008). If this is the case, it is imperative to simulate accurately the three-dimensional density structure. We have setup a hydrodynamic model of the Wadden Sea using GETM, and the results have been validated using several observational data sets. For benchmarking, Deltares runs a similar model with Delft3D. In this work, we discuss some of the modeling challenges and the effect on the flow evolution of the time dependence of the fresh water discharge at the sluices at the Afsluitdijk. Due to the high accuracy of this model, its results can be further applied as input for ecological models, which are important to predict the morphological changes in the Wadden Sea (Borsje et al. 2008).

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