Understanding sediment disposals on the Walsoorden tidal flat in the Western Scheldt

R.A. Schrijvershof[1], J. van der Werf[1], P.L.M. de Vet[1,2], G. Willemsen[3]
[1] Deltares, Reinier.Schrijvershof@Deltares.nl, Jebbe.vanderWerf@deltares.nl, Lodewijk.deVet@deltares.nl
[2] Technische Universiteit Delft, [3] geertwillemsen@gmail.com

Introduction

The deepening and expansion of the Western Scheldt navigational channel in 2007-2010 demanded alternative disposal locations. One of these was the seaward tip of the intertidal shoal 'Plaat van Walsoorden' (Figure 1). This tip has been subject to a continuous trend of erosion in the second half of the last century. Disposing the sediment here is aimed to: (1) counteract erosion; (2) increase low-dynamic intertidal area, creating ecologically valuable habitat; and (3) increase the divergence of discharge between the main and secondary channel to strengthen the stability of the multiple channel system.

The morphological behaviour of the sediment disposals is well monitored and detailed measurements show that the disposed sediment migrates predominantly in flood direction, replenishing the intertidal area of the shoal. It is, however, not well understood why the sediment moves in this direction, what the more large-scale hydro- and morphodynamic effects of the disposal are, and what the controlling physical processes are. Such a comprehensive understanding of the morphodynamics of the sediment disposals enables managing authorities to optimise their sediment dumping strategy.

Methods

A high-resolution depth-averaged model (Delft3D) was set-up to simulate the morphological development of the sediment disposals, forced by tide, wind and waves. The hydrodynamics of the model were validated with velocity measurements collected during two campaigns in 2013. A representative morphological period was used to simulate the morphological development of the migration of the disposed sediment.

Results

First modelling results show that the model is well capable of reproducing the morphological development between September 2010 and October 2011, after the first disposal period (Figure 1). The disposal decreases the maximum current velocities locally, in line with the second aim of the sediment disposal.

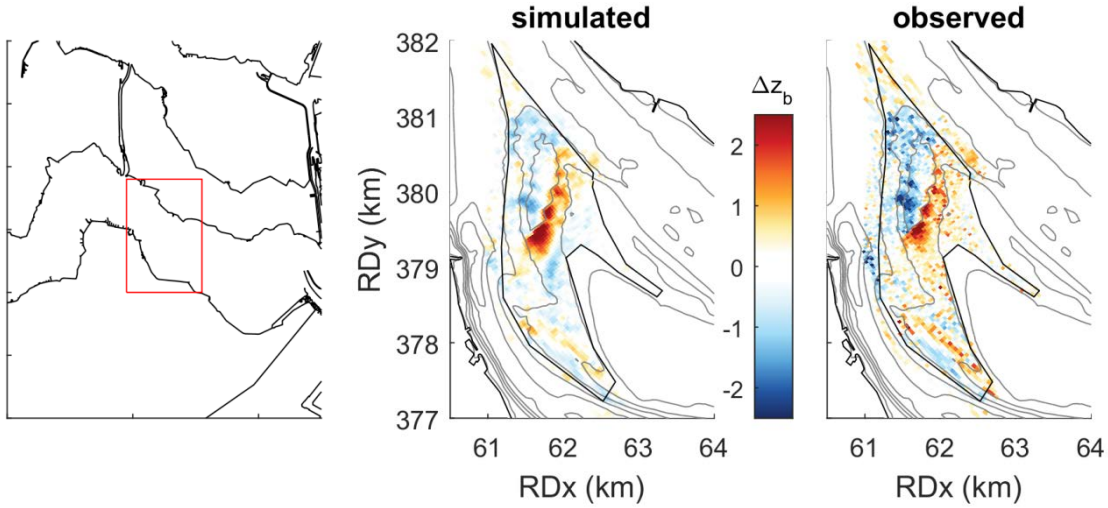

Figure 1: Location of the Walsoorden tidal flat in the Western Scheldt and erosion-sedimentation patterhn in the period September 2010 – October 2011; simulated (left) and observed (right).

Apart from reproducing the historical evolution we focus on identifying the physical (e.g. waves) and anthropogenic (e.g. dredging and dumping) processes that drive the morphological development of the sediment disposal. This new system understanding supports better sediment management in the Western Scheldt.