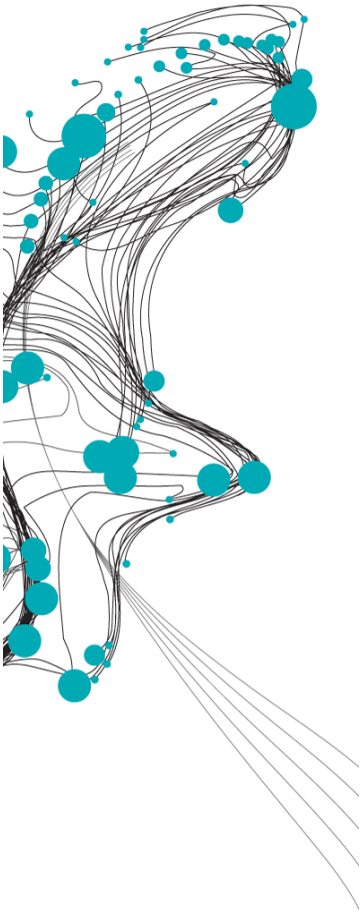
Coastal erosion processes in tidal channel Oostgat



The coastward channel slope of tidal channel Oostgat along the coast of Walcheren (NL) migrates in landward direction by 0.2m per year between Westkapelle and Zoutelande (Tonnon and Van der Werf, 2014). In addition to annual beach nourishments of 0.2 million m^3 channel slope nourishments have been applied in 2005 and 2008 with a total volume of 8.5Mm^3. These measures prove effective to maintain the current coastline position as is required by the Dutch coastal policy. However, the processes responsible for the erosion are not well known. The aim of this study is to increase our understanding of the lateral migration behaviour of the tidal channel Oostgat.

To analyse sediment transport in the Oostgat channel, a 2DV Delft3D model has been created for the ebb-tidal delta of Scheldt estuary. Model results showed good similarity to the calibrated model Delft3D-NeVla which includes the entire Scheldt estuary. A representative morphological tide has been selected based on a comparison of sediment transports of the individual tidal cycles to the average transport for multiple spring-neap cycles. Furthermore, a representative wave climate has been derived using the OPTI method (Mol, 2007) to reduce the complete wave climate to 9 wave conditions.

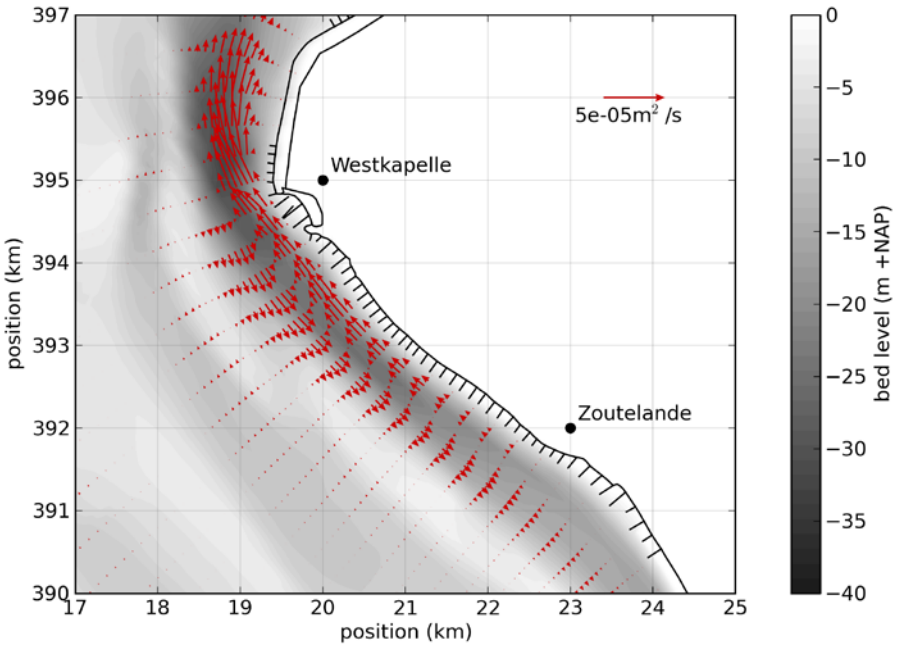


Figure 1: Residual transports for the representative tidal cycle in the tidal channel Oostgat

The model results show a divergence in residual sediment transports along the coastward side of the tidal channel (Figure 1). This divergence results in erosion along the channel slope. A comparison of the influence on the coastal erosion by tide, waves and wind indicates the tide as the dominant forcing mechanism.

A shift of the flood velocities towards the outer bend near Westkapelle causes flood dominance at the seaward side of the channel with resulting flood directed transports. This effect can be explained by the inertia of the flow as it passes the bend in the channel. The shift of the flood velocities also causes ebb dominance at the inner bend with ebb directed residual transports. A further shift of the ebb velocities towards the inner bend was also found, but could not be explained in this study. Possible causes are the contraction of the flow at the bend and a large water level gradient between the Oostgat and the area to the northeast which forces the flow along the coast. These effects should be investigated in a later study. The results of this study increased the knowledge of the channel slope erosion processes in the Oostgat and indicated the processes that are required for the accurate modelling of sediment transport patterns in the tidal channel. This knowledge can be used to implement more efficient measures aimed at the cause of the erosion.

Mol, A. C. S. (2007). R&D Kustwaterbouw Reductie Golfrandvoorwaarden.
Tonnon, P.K. and J.J. Van der Werf (2014). Geulopdringing Zuidwest Walcheren. Report 1208921-000, Deltares.

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