

Towards a classification of the morphological development of intertidal flats: a comparison between the Eastern and Western Scheldt.

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1. Introduction

The Eastern and Western Scheldt are two adjacent estuaries, which are both strongly affected by human interventions, see Figure 1. In the Eastern Scheldt, the storm surge barrier led to a substantial reduction of the tidal range. In the Western Scheldt, dredging works cause an ongoing deepening of the navigation channels. In this research, morphological data of both estuaries is studied to get to a morphological classification of the response of intertidal areas to these interventions. To obtain a better fundamental understanding of the system, a comparison of data to existing conceptual theories is made.



Figure 1: Location of the Western Scheldt [1], the Eastern Scheldt [2], the storm surge barrier [3] and the Galgeplaat [4] (Source: Google Earth).

2. Results

A clear change in shape of some of the intertidal flats is observed after the Eastern Scheldt was closed by the storm surge barrier in 1986. Figure 2 shows the morphological evolution of the northern section of the Galgeplaat. The profile evolves clearly from a convex-up profile towards a concave-up profile. Friedrichs (2011) states that a concave-up equilibrium profile is associated with a relatively large wave forcing. By the presence of the storm surge barrier, the wave forcing did indeed increase relatively to the tidal forcing, as the tidal amplitude was reduced. Also other features mentioned by Friedrichs are observed in the Eastern Scheldt estuary: by the relatively large importance of waves, some profiles are retreating (e.g. near the Anna Jacoba Polder).

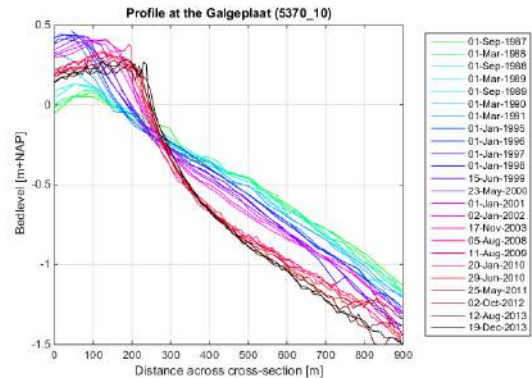


Figure 2: Profile evolution at the northern face of the Galgeplaat, measured with RTK gps (Source data: personal communication, Rijkswaterstaat, 2014).

The theory of Friedrichs (2011) does not explain all morphological changes in the system, partially because it only considers equilibrium profiles. For example: the steepening and heightening of the intertidal flats in the Western Scheldt cannot be understood entirely with this theory. Further research aims at a better understanding of the estuaries by extending theories, like the one of Friedrichs, to the conditions in the Eastern and Western Scheldt.

3. Conclusions

As observed in the data, there are locations in the estuaries for which the intertidal areas respond in line with the theory of Friedrichs (2011) to human works. However, there are also tidal flats for which the morphological changes cannot be understood with the theory of Friedrichs and other insights are required.

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References

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