RCEM 2019

THE 11TH SYMPOSIUM ON RIVER, COASTAL AND ESTUARINE MORPHODYNAMICS

BOOK OF ABSTRACTS

AUCKLAND, NEW ZEALAND
16TH–21ST NOVEMBER 2019

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rivers
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A joint technical interest group of Engineering New Zealand & Water NZ

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2019

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Flow measurements in a tidal flat: field campaign and results

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1. Introduction

Since the 13th century, in The Netherlands the inhabitants started to reclaim lands, creating a large number of polders. This process has caused the loss of natural intertidal areas, essential for the safeguard of the dikes from the rising sea level, caused from the climate change. For this reason, the European governments started to boost the protection of the existing intertidal areas and the creation of new ones. One of these projects refers to depoldering the Perkpolder area, in the Western Scheldt (NL) to develop a natural intertidal zone (ca. 70 ha). To characterize the hydrodynamic field in the new wetland, a velocity measurement campaign has been carried out.

2. Velocity measurements

An acoustic velocity profiler also equipped with a pressure cell was installed on different representative locations on the study area, measuring continuously water velocity along the vertical and water level. Tide level was registered in Walsoorden station, located on the Wester Scheldt, nearby the area inlet. The period of measurements has extended by 21 days between April and May 2018, to cover almost an entire tidal cycle. The flow field was characterized both in the channels network and in the mudflat. By combining the observed data with the DEMs of the Perkpolder obtained from available Lidar and Multi-Beam echosounder measurements, it has been possible to compare the direction of the water flow with the channel one.

3. Velocities profiles on the vertical

By observing the velocity profiles on the vertical it can be affirmed that, comparing the profiles corresponding to measurements collected in a small time interval (3 minutes), their trends are quite similar. Although the profiles are similar to each other, in the vertical direction the velocities do not increase or decrease uniformly but they have an irregular behaviour, especially in the instants corresponding to the maximum velocity.

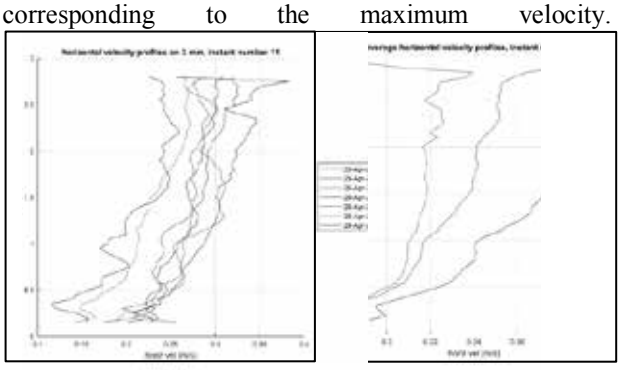

Figure 1: on the left the velocity profiles on the vertical measured in a time interval of three minutes, on the right three average profiles (from left to right: profile averaged on 15 minutes, 6 minutes and 3 minutes).

4. Plan view representation

From the velocity data collected in the Perkpolder basin it has been possible to obtain a representation of the velocity in the East-North plan.

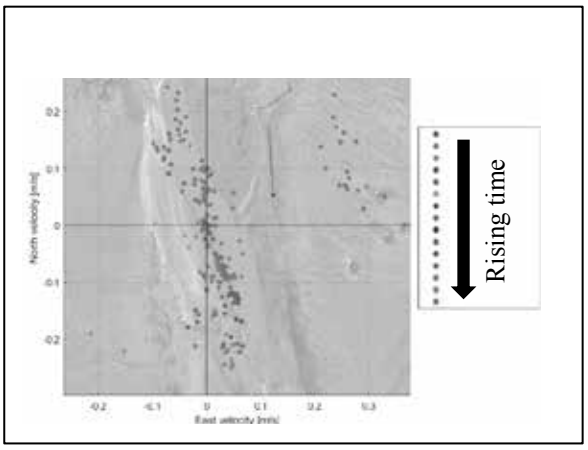

Figure 2: plan view representation of the horizontal velocity

From this representation it is clear that the water flow mainly follows the channels direction.

4. Conclusions

By analysing the flow velocity data, it can be stated that the prevalent velocity components are the East and the North components. In the channels, the general velocity trend is consistent with the tidal phase; in fact, it is positive during the flood phase and negative during the ebb phase. The most regular profiles on the vertical can be found in correspondence to the peaks of the water level measured by the instrument, probably due to the presence of lower values of the horizontal velocity. By looking at the plan view representation of the horizontal velocities, it can be observed that, in the channels, the water flow is ducted. In the channels, the average value of the maximum velocity reached in the flood phase is, in general, higher than the averaged minimum velocity (in absolute value) reached in the ebb phase. This underlines a flood dominant behaviour that is consistent with the sedimentation process highlighted in Perkpolder. In fact, according to (Friedrichs and Aubrey, 1988), "Flood-dominant lagoons and estuaries (having shorter duration, higher velocity floods) tend to infill their channels with sediment. Ebb-dominant systems (having shorter, higher velocity ebbs) tend to flush bed-load sediment seaward more effectively and may represent more stable geometries".

References

Friedrichs C. T., Aubrey. D. G. (1988). *'Non-Linear Tidal Distortion in Shallow Well-Mixed Estuaries: A Synthesis'. Estuarine, Coastal and Shelf Science* 27(5):521–45.