

MEASURING SUSPENDED-SEDIMENT TRANSPORT IN THE INTERTIDAL ZONE OF A MACRO-TIDAL BEACH (MARIAKERKE, BELGIUM)

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Introduction

The intertidal beach, the part of the beach between the low- and high-water line, is very dynamic. It receives most of the wave energy and is affected by currents and wind. However, the effect of hydrodynamic forcing on the intertidal beach morphology is not yet fully understood. This is mainly due to a shortage of field studies relating hydrodynamic forcing, sediment transport, and morphological response in the intertidal area. Therefore, two measuring campaigns were carried out in the intertidal zone of Mariakerke (Belgium). A frame (Figure 1) was deployed near the low-water line to measure wave height and period, profiles of flow velocity, and suspended-sediment concentration. The topography of a 300 x 300 m stretch of the beach was measured with a mobile laser scanner three times during the campaigns. In addition, the topography of five cross-shore profiles was measured daily with an RTK-GPS.

Results

The results show that the suspended-sediment concentration is weakly related to local bed shear stress. The largest part of the suspended sediment is thus supplied by incoming currents. Under calm conditions the suspended sediment is transported in the same direction as the observed topographic changes suggest. However, under more energetic conditions there are large differences between measured sediment transport and sediment transport derived from topographic changes.

The beach at Mariakerke is macro-tidal, with a tidal range of 5 m during spring and 3.5 m during neap tide. As a result, topographic changes are related to both waves and tidal currents. During spring tide the currents are generally directed alongshore and erosion is observed. During neap tide wave effects become dominant, especially when the wave height is large (> 1 m). The currents then become cross-shore directed and accretion is observed. However, large waves (height > 2 m) lead to erosion.



Figure 1. Intertidal measuring frame with 3 optical backscatter sensors, 3 acoustic current profilers, 1 electromagnetic current meter, and 1 pressure sensor (not on photograph).