How waves and suspended sediment affect the beach that we see

Brand Evelien[1], Montreuil Anne-Lise[1], Chen Margaret[1] and Dan Sebastian[2]

[1] VUB, Pleinlaan 2, 1050 Elsene, Belgium
E-mail: evelien.brand@vub.be
[2] Flanders Hydraulics Research, Berchemlei 115, 2140 Antwerpen-Borgerhout, Belgium

In Belgium more than half of the coast is currently eroding and sand nourishments are carried out regularly. With climate change and sea level rise this will only be worse and thus coastal areas will be increasingly vulnerable to coastal storms and floods. To protect the beach efficiently, a good understanding of the beach dynamics is necessary. Therefore, the aim of this study is to relate beach morphological changes to hydrodynamics, such as waves and currents, and suspended sediment concentrations.

This study was carried out at Mariakerke, close to Oostende, a managed beach characterized by groins, a seawall and frequent sand nourishments. More than 1.5 years of data was collected and analyzed. Waves, currents, and suspended sediment concentrations were measured in the nearshore zone at -5 and -8 m TAW. This was done at two beach sections that are one kilometer apart. At both sections the beach topography of three cross-shore profiles was measured every month.

The results show that the beach grows when the wave height is small and the wave period is large. The beach erodes when the waves become steeper, *i.e.* have a larger height and a smaller period. However, when the wave height is medium, the beach erodes under small waves and grows under large waves. This can be related to an increase in suspended sediment concentrations when waves are medium. Flood dominant currents transport the sediment shoreward. For medium waves this results in partial compensation of erosion by waves. Thus, the beach topography is influenced by wave impact, but also by suspended sediment supply.

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