

Wave attenuation and intertidal morphology of a multi-barred macrotidal beach behind a breakwater

Arnaud Oblinger and Edward J. Anthony

Summary. A two-week survey involving intertidal beach topographic measurements and waves was carried out on a macrotidal (mean spring tide range = 5.6 m) bar-trough beach behind one out of the three detached breakwaters east of the port of Dunkerque (Dunkirk) in the southern North Sea. The study was aimed at highlighting the effects of this structure on waves, and consequently, on the beach morphology and sediments. The breakwater, the crest of which lies at the mean high water neap tide level, and only 1.05 m below the mean high water spring tide level, is attained by waves largely dampened by numerous shallow nearshore sand ridges and banks. The breakwater completely attenuates waves during a large part of the rising and falling limbs of the tide, through wave breaking on its seaward face when tide-modulated water depths do not allow for breakwater overtopping. Wave attenuation by the breakwater has encouraged mud accumulation in the immediate wave shadow zone of this structure, and has resulted in the formation of a mild salient associated with an intertidal bar-trough morphology that is much more subdued compared to similar beaches east of the breakwater. These morpho-sedimentary features are largely favoured by the macrotidal context. The breakwaters contribute to the overall beach stability observed since the first two were built in 1978, and the third, monitored in this study, in 1984.