TIDE-TOPOGRAPHY INTERACTIONS NEAR THE KINK IN THE WESTHINDER SANDBANK (SOUTHERN NORTH SEA)

Deleu Samuel[1], Vera Van Lancker[1], Dries Van den Eynde[2] and Geert Moerkerke[1]

[1] Ghent University (RUG), Renard Centre of Marine Geology (RCMG),
Krijgslaan 281 S8, B-9000 Gent, Belgium
E-mail: samuel.deleu@rug.ac.be

[2] Management Unit of the North Sea Mathematical Models (MUMM)
Gulledelle 100, B-1200 Brussel, Belgium

The aim of this study is to describe the complex interactions between the sedimentology, the morphology and the hydrodynamics near a kink in the Westhinder sandbank and to combine these data to understand the sediment transport. This bank lies in the northern part of the Belgian continental shelf, where the main hydrodynamical agents are the tidal currents. The characteristics of these are incorporated in a hydrodynamical model (MUMM) with a grid resolution of 250 m. The current ellipses show a dominating NE-SW direction with the strongest currents in the swales orientated to the southwest and on the bank to the northeast. These ellipses become also more circular on the bank. The maximum current strengths are higher on the bank, especially over the kink region and the area just north of it and somewhat lower just west of the kink on the stoss slope where coarser deposits are found. Two multibeam surveys over the area formed the basis of an acoustical seabed classification, that is ground-truthed by 59 surficial Van Veen grabs. The different data sets point to a special regime over the kink compared to the adjacent parts of the bank which are covered with larger dunes, culminating at the crest of the bank into a symmetrical very-large dune. Here the bank is actively maintained by a net sediment transport up both bank flanks. The kink part of the bank lies deeper, is characterized by a steeper eastern flank and by eastward movements of the very-large dunes over both bank flanks. Sedimentological data reveal that coarser material is found just west of the stoss slope, which can be explained by the fact that the peak flood current is hindered by the changing orientation of the bank northwards into a more N-S position. The finest sediments are found on the lee slope and are likely washed out from the stoss slope, confirmed by the band of less sorted sediments up the stoss slope in the kink and by the areal representation of the grain-size distribution graphs. The sediment transport model set up by MUMM correlates well with the sediment transport results deduced from the bedform asymmetries and shows transport to be stronger on the northern and southern bank parts of the study area. Sediment transport in the swales is to the southwest and is weaker.

All the results combined show that it might be possible that a break-through of the bank will occur, but as the Hinder Banks are known to be stable in time, this will take probably thousands of years.