AEOLIAN SEDIMENT TRANSPORT ON A BELGIAN BEACH : SPATIO-TEMPORAL VARIABILITY DURING ALONGSHORE WINDS

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Half of the Belgian coast consists of coastal dunes which acts as the primary defence against storm events. Aeolian sediment transport from the beach towards the dunes is important for coastal dune evolution. However, important factors in coastal aeolian processes, such as wind speed, wind direction and surface characteristics are characterized by a large spatial and temporal variability. These make the processes even more complex. This field study identifies the short-term (hours) behaviour of aeolian transport and surface elevation changes on the backshore and foredune at Oostduinkerke, Belgium. The region in front of the dune foot is characterized with a zone of debris and shell fragments deposited by tidal uprush. Aeolian transport studies commonly deploy a single transect parallel with the wind direction, assuming there is no variation in sediment transport lateral to this transect. In this experiment, twelve Modified Wilson And Cook (MWAC) sand traps were positioned in a cross and were exposed to alongshore winds on 29 January 2018 (Figure 1A). Wind speed 2 m above the dune foot averaged 10.82 m/s. Three sampling runs were carried out between 10h20 and 18h00. Along the backshore, large aeolian sand strips (approximately 5 m wide) were moving in the downwind direction due to high energy transport events, causing a large spatio-temporal variability in sediment transport (Figure 1B). In the alongshore trap array Z1-Z6, trapping rates varied as the sand strips moved spatially over time (see blue bars in Figure 1B). Based on photo imagery and Figure 1B, the exact location of the sand strips can be identified. A sand strip was observed between traps when there was a decrease in sediment transport. An increase in sediment transport between traps showed no sand strip. In the cross-shore transect Z7-Z3-Z12, substantial differences in transport rates over a relative short distance (6 m) are observed at the backshore (see red bars in Figure 1B). Transport rates in the dune region were lower than measured at the backshore. Moreover, variations in vertical flux profiles between traps were larger in the foredune, where vegetation influenced sediment transport. This paper presents the results of the experiment.

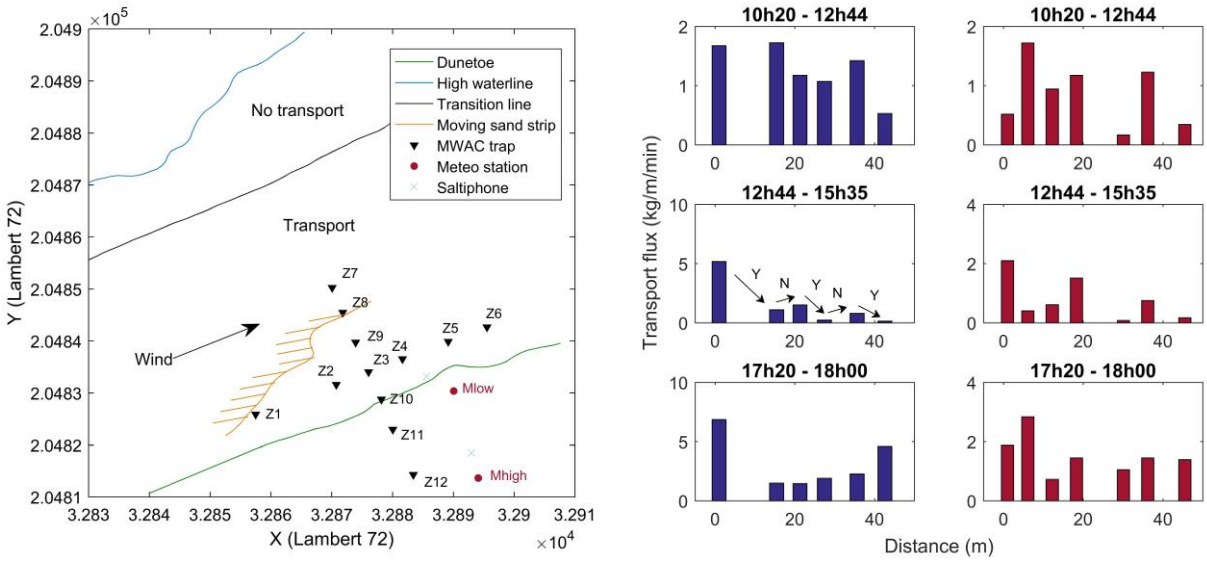

Figure 1. A) The locations of the instrumentation. One of the moving aeolian sand strips is shown. B) Spatio-temporal variability in sediment transport for three sampling runs. Blue bars represent the alongshore array Z1-Z6 (Z1 is upwind , 0 m). A sand strip was observed beteen traps when there was a decrease in sediment transport and vice versa. Red bars represent the cross-shore array Z7-Z3-Z12 (Z7 is the lower trap at the backshore, 0 m).