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Agglomeration of a comprehensive model for the wind-driven sand transport at the Belgian Coast

Glenn Strypsteen and Pieter Rauwoens

KU Leuven, Faculty of Engineering Technology, Department of Civil Engineering, Technology Cluster Construction, Ostend, Belgium (glenn.strypsteen@kuleuven.be)

Although a lot of research has been done in the area of Aeolian transport, it is only during the last years that attention has been drawn to Aeolian transport in coastal areas. In these areas, the physical processes are more complex, due to a large number of transport limiting parameters. In this PhD-project, which is now in its early stage, a model will be developed which relates the wind-driven sand transport at the Belgian coast with physical parameters such as the wind speed, humidity and grain size of the sand, and the slope of beach and dune surface. For the first time, the interaction between beach and dune dynamics is studied at the Belgian coast. The Belgian coastline is only 67km long, but densely populated and therefore subject to coastal protection and safety. The coast mostly consists of sandy beaches and dikes. Although, still 33km of dunes exist, whose dynamics are far less understood. The overall research approach consists of three pathways: (i) field measurements, (ii) physical model tests, and (iii) numerical simulations. Firstly and most importantly, several field campaigns will provide accurate data of meteo-marine conditions, morphology, and sand transport events on a wide beach at the Belgian Coastline. The experimental set-up consists of a monitoring station, which will provide time series of vegetation cover, shoreline position, fetch distances, surficial moisture content, wind speed and direction and transport processes. The horizontal and vertical variability of the event scale Aeolian sand transport is analyzed with 8 MWAC sand traps. Two saltiphones register the intensity and variations of grain impacts over time. Two meteo-masts, each with four anemometers and one wind vane, provide quantitative measurements of the wind flow at different locations on the beach. Surficial moisture is measured with a moisture sensor. The topography measurements are typically done with laser techniques. To start, two sites are selected for measurement campaigns: one consists of the typical beach – dike system, a second site involves the dunes. First results of the measured data will be presented at the conference, together with a comparison to empirical correlations available in literature. Next to the field measurements, we propose physical model tests to provide data that is difficult to measure in the field. They will be used to determine the shear velocity and critical shear velocity in function of the transport flux. The effect of surficial moisture, vegetation and morphologic landforms will also be investigated in the model tests. Numerical simulations will provide a better insight in the physical processes of the Aeolian events and will be validated with the experimental results from the field campaigns and the physical model tests. The ultimate goal of the PhD is to obtain a sand transport model for the Belgian Coast, which can be used to assess the stability of nourishments in a quantitative matter, but it also will gain a better insight in the beach and dune interactions with the changing climate.