Macrotidal Beach Monitoring (belgium) Using a Hypertemporal Terrestrial Lidar

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SUMMARY

Knowledge on natural sand dynamics is essential for the coast protection in many countries, especially in countries with very low coastal regions such as the Netherlands and Belgium. Monitoring sand dynamics is commonly done through sediment budget analysis, which relies on determining the volumes of sediment added or removed from the coastal system. These volumetrics require precise and accurate 3D data of the terrain, preferably as less time intensive as possible. Earlier research states the potential of permanent long-range terrestrial laser scanning for continuous (e.g. hourly) monitoring of coastal dynamics.

For this paper, this methodology has been implemented at an ultra dissipative macrotidal North Sea beach in Mariakerke (Ostend, Belgium). A Riegl VZ-2000 LiDAR, mounted on a 42 m high building, scanned the intertidal and dry beach in a test zone of ca. 200 m wide on an hourly basis over a time period of one year.

It appeared that the static laser scanner cannot be assumed to have a fixed zenith direction for each hourly scan, as was months later also mentioned by other researchers in The Netherlands. The scanner compensator measured a variable deviation of the Z-axis of more than 3.00 mrad. This results in a deviation of ca. 900 mm near the low water line. A robust calibration procedure was therefore developed to correct the deviations of the Z-axis. In this paper, we start by presenting the results achieved with different strategies of calibration.

Finally, we compare the quality of the DEM model based on the stationary scanner with an aerial LIDAR DEM model with a similar spatial resolution.