# WIMO - LASER SCANNING FOR MONITORING THE GERMAN WADDEN SEA

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**ABSTRACT:**

The topographic modelling and change detection of Wadden Sea areas are important tasks of marine monitoring. In coastal areas morphological changes are caused by tidal flows, storms, climate change, other natural causes and human activity. A recurrent monitoring of these areas is necessary in order to detect undesired changes at an early stage, enabling rapid countermeasures to mitigate or minimize potential harm or hazard.

The morphology of the terrain can be represented by highly precise digital terrain models (DTM). Airborne laser scanning / lidar (light detection and ranging) has become a standard method for DTM generation in coastal zones like Wadden Sea areas. In comparison to echo sounding systems, lidar is feasible for data acquisition of large areas. However, only the eulittoral zone can be covered by standard laser because the near-infrared laser pulses are not able to penetrate water which partly can be found also at low tide, e.g. in some tidal channels.

In the framework of the German research project WIMO (Wissenschaftliches Monitoring der Nordsee - Scientific monitoring of the North Sea), we analyse the spatial and temporal variability of Wadden Sea areas in the North Sea. For a systematic monitoring and the detection of morphological changes we compare terrain models of different epochs in order to determine height differences which can be caused by natural influence or human activity like dredging or deepening of channels. We focus especially on the analysis of morphological changes near tidal channels which are expected to shift by some meters per year due to sediment transport. We compute the DTM for different epochs and determine the height differences over this time period. We also derive edges from each DTM by standard edge detectors. In this way, changes of significant structures in the topography such as break lines can be analysed. For the detection of the complete network of tidal channels we integrate model-based knowledge in a stochastic approach based on Marked Point Processes. We evaluate our approach on a test site of the German part of the Wadden Sea.