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Monitoring and change detection of Wadden Sea areas using Lidar data

A. Schmidt[1] and U. Soergel[2]

[1]Institute of Photogrammetry and GeoInformation, Leibniz Universität Hannover, Germany
[2]Institute of Geodesy, Chair of Remote Sensing and Image Analysis, TU Darmstadt, Germany

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Abstract. In coastal areas morphological changes of various kinds are caused by tidal flows, storms, climate change, and human activities. For these reasons a recurrent monitoring becomes necessary in order to detect undesired changes at early stages 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 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 remains, for example, in some tidal channels even during low tide. In the framework of a German research project, 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 two different epochs in order to determine height differences which can be caused by natural influences or human activities. We focus especially on the analysis of morphological changes near to tidal channels. In order to detect changes we compare the location of edges derived from each DTM based on the gray values' gradients. Our results for a test site in the German Wadden Sea show height differences up to 1 m due to the shifting of tidal channels and relocations of the channels up to 55 m within a period of two years.

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