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Topobathymetric LiDAR point cloud processing and landform classification in a tidal environment

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Historically it has been difficult to create high resolution Digital Elevation Models (DEMs) in land-water transition zones due to shallow water depth and often challenging environmental conditions. This gap of information has been reflected as a "white ribbon" with no data in the land-water transition zone. In recent years, the technology of airborne topobathymetric Light Detection and Ranging (LiDAR) has proven capable of filling out the gap by simultaneously capturing topographic and bathymetric elevation information, using only a single green laser. We collected green LiDAR point cloud data in the Knudedyb tidal inlet system in the Danish Wadden Sea in spring 2014. Creating a DEM from a point cloud requires the general processing steps of data filtering, water surface detection and refraction correction. However, there is no transparent and reproducible method for processing green LiDAR data into a DEM, specifically regarding the procedure of water surface detection and modelling. We developed a step-by-step procedure for creating a DEM from raw green LiDAR point cloud data, including a procedure for making a Digital Water Surface Model (DWSM) (see Andersen et al., 2017). Two different classification analyses were applied to the high resolution DEM: A geomorphometric and a morphological classification, respectively. The classification methods were originally developed for a small test area; but in this work, we have used the classification methods to classify the complete Knudedyb tidal inlet system.

References

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