

LIDAR investigations in the German Baltic Sea - Status and further activities

At BSHC20 Germany was tasked to report on the outcome of the three years project on the use of LIDAR in the southern Baltic Sea. Since the full report of the project is available in German language only, this Explanatory Note provides a brief summary of the project results and is annexed by a copy of a more detailed scientific publication in English language. The German version of the report is available on request as well.

„Investigations on the use of airborne laser bathymetry in hydrographic surveying” („Untersuchungen zum Einsatz der Laserbathymetrie in der Seevermessung“)

Summary of the project report

The method of bathymetry LIDAR represents a new technique of airborne surveying of the seefloor in shallow waters. It is therefore an alternative to the conventional ship based echo sounding, which is time consuming and costly. The task was to investigate whether comparable accuracies can be obtained and whether this method is economically advantageous.

The report summarizes the results of the project executed in cooperation between the Federal Maritime and Hydrographic Agency in Germany (Bundesamt für Seeschifffahrt und Hydrographie - BSH) and the Institute for Photogrammetry and Geoinformation of the Leibniz Universität Hannover (Institut für Photogrammetrie und GeoInformation - IPI), in which the potential of airborne laser bathymetry (ALB) for the use in hydrographic surveying at the German coast of the Baltic Sea has been determined. In three surveying campaigns at a test area next to the island of Poel different state-of-the-art sensors were used to derive a three dimensional model of the seafloor. The main focus of the processing were to derive the maximum depth to be detected, the data density in different water depths as well as the vertical accuracy of the resulting point cloud. The limitation in the visibility in the water is the substantial and limiting environmental factor.

It is obvious that with airborne laser bathymetry good results can be achieved in the German Baltic Sea. Depending on the sensor up to a depth of twice the Secchi-depth the requirements of order 1b of the Standards for Hydrographic Surveying of the IHO can be fulfilled by a good portion. An exception constitutes the detection of wrecks and other obstructions. With the current state of the technology object detection is not reliable.

A map showing the areas that can potentially be surveyed from an airplane at the German Baltic Sea is a result of the analysis. The cost-effectiveness was investigated in the frame of the project additionally to the quality evaluation of the point cloud. The estimated costs of a survey executed with ALB and of a ship-based echo sounding of the seafloor were compared. The result is also part of the report. The estimation leads to reduced costs for ALB in the area in question.

The derived data would still have a higher point density as echo soundings and cover additional areas in the extreme shallow waters at the coast which are out of reach for vessels and launches. These areas are of interest for example for coastal protection. Thus an added value can be expected and potential co-operations could lead to a further improvement of the cost-effectiveness when tendering such a survey and sharing the costs.

In the end of the report the experiences of the parameters are recapped regarding tenders of ALB. This shall assist for potential tenders in the future.

In addition to the project information provided herewith, reference is made to the forthcoming **Hydro 2016 Conference** in Rostock-Warnemünde, 8 – 10 November 2016, where a full session is designated to bathymetric LIDAR on Wednesday 9 November:

Session 7A: LiDAR case studies for hydrographic assessments

15:50 [7A1] Frank Steinbacher: High resolution, topobathymetric LiDAR coastal zone characterisation in Denmark

16:15 [7A2] Patrick Westfeld: Analysis and modeling of the effect of wave patterns on refraction in airborne LiDAR bathymetry

16:40 [7A3] Wilfried Ellmer: Use of laser bathymetry at the German Baltic Sea coast

17:05 [7A4] Lutz Christiansen: New techniques in capturing and modelling of morphological data

17:30 [7A5] Mark Sinclair: Object detection by ALB

The Commission is invited to

- take note of the report;

Annex: Yujin Song et al: Comparison of three airborne laser bathymetry data sets for monitoring the German Baltic Sea Coast, Proc. of SPIE Vol. 9638 96380Z-1, September 2015