AIRBORNE LASER SCANNING FOR THE PURPOSE OF HYDRODYNAMIC MODELLING OF WIDAWA RIVER VALLEY

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Introduction

Airborne Laser Scanning (ALS) is a new technology for capturing data for a detailed Digital Terrain Model (DTM) acquisition, especially to mapped and unmonitored areas. This measurement technique enables directestimation of the erosion and deposition processes with the resolution of point per m². ALS was applied for DTM generation of a stream and valley floor of the Widawa river within the scope of the project "Widawa". The project was supported by the Research Council of Germany. The measurements were made to assess the impact of the regulation of the Widawa river, which was carried out by the University of Bremen in this project. The prototype of the system was a laser scanner ScALARS was used.

The ALS System

The figure shows the system layout, including the aircraft, data processing chain, and technical specifications of the ScALARS II laser scanner.

Technical specifications of ScALARS II

- Laser source: GI laser (690 nm) (ablation)
- Laser wavelength: 690 nm (80 mJ)
- Laser divergence: 2.5 mrad
- Angular field of view: 25°
- Vertical resolution: 25 Hz
- Frequency: 10 kHz, 1 MHz
- Max. scan range: 750 m
- Flight altitude: 120 m, 450 m
- Flight speed: 100 km/h
- Flight time: up to 20 minutes
- Number of channels: 1
- Number of pulses: 1
- Number of laser beams: 1
- Number of ADCs: 1
- Number of bits: 12

Operational Processing Chain

The diagram outlines the operational processing chain, starting with flight parameters, followed by sequential processing and calibration, position and orientation, geocoded sequential laser points, and digital terrain generation.

Use of the ALS Data for hydrodynamic modelling

- Differential model (DSM, DTM) is applied in resistant factor estimation,
- Reflection intensity image is also applied in resistant factor estimation,
- Laser reflection distribution in vertical cross-sections may be used for wood layers estimation,
- DTM is used for flood wave flow modelling.

Mission planning

Orthophoto

The orthophoto shows the survey area with the laser scanning flight trajectory.

Map of intensity of reflection

The map illustrates the intensity of reflection across different areas.

Digital Model

The digital model includes a DSM, DTM, and DSM - DTM, with an orthophoto over DSM.

Cross-section: point cloud on afforested area

The cross-section displays the point cloud over an afforested area.