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Comparison of airborne, mobile and terrestrial laser scanning data to survey mass movements and protection measures on potentially dangerous slopes.

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Mass movements are complex natural hazard processes and have been investigated in various ways. In recent years laser scanning methodology has been introduced for monitoring mass movements. Laser scanning provides high resolution point cloud data for the creation of digital surface models (DSM). Such DSM's can be compared and contrasted with DSM's of the same area surveyed by different monitoring activities to show patterns of mass movement processes. The accuracy of such DSM's strongly depend on the method of laser scanning and the instrument applied.

Therefore a comparison of different carriers and their respective methods of laser scanning was executed. The same area was surveyed by 1) airborne laser scanning, 2) terrestrial laser scanning and the most recently developed method: 3) mobile laser scanning. Airborne laser scanning was carried-out using Riegl LMS-Q560 mounted in combination with an IMU/GPS system for positioning on a small aircraft. A Riegl LMS-Z420i device was applied for terrestrial laser scanning. Mobile laser scanning was executed from a ship involving Riegl LMS-Z620 and Riegl VZ-400 scanning devices, also in combination with an IMU/GPS system for positioning.

The measured area contains a forested, partially steep slope. Mass movements on that slope endanger a railway track as well as an important road. Therefore protection measures have been built on the slope. To execute a quality investigation of the laser data, rare point cloud data as well as post processed data was compared. The following parameters were investigated for each carrier method: point cloud density, point spacing, foot print size, single point accuracy with respect to differential GPS measurements, coverage of the area including terrain coverage beneath the forest canopy and homogeneity of the datasets with respect to each other.

Results of the different measurements are presented. The advantages as well as limitations of each method are discussed and applications for monitoring and researching mass movements are described.