



The creation of high resolution digital elevation models in steep alpine terrain using terrestrial laser scanning, differential GPS and tachymetry to monitor bed load transport of torrents.

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Torrents present a serious hazard in alpine regions. The material incorporated into torrents is inherently complex, varying from clay sized solids to boulders of several meters in diameter.

For geoscientists it is important to predict possible initiation zones and deposition areas or run-out lengths. Run-out analysis is an especially important component of hazard assessment in alpine watersheds, which includes prediction of potential hazard areas and mapping the distribution of hazard intensity parameters, such as the thickness of deposited material.

In this study various remote sensing techniques have been applied to investigate the spatial distribution of bed load material deposited by torrents. Due to the steep alpine topography and the methodology used, the various terrestrial surveying approaches were necessary to create high resolution DEMs (digital elevation models) of the test area. Several monitoring activities prior to and after an event required global data registration using differential GPS. Tachymetry was used to connect areas without GPS reception to those measured with GPS. Terrestrial laser scanning (TLS) provided dense 3D-data. The RIEGL LMS-Z420i was chosen as the TLS device due to its long range, high accuracy and high scanning speed. The objectives of surveying the torrent deposit with TLS were to determine the volume of deposited matter as well as to detect zones of material erosion and deposition by creating high resolution DEMs.

The results of measurements taken at test sites in Carinthia, Austria are presented and their reliability for planning protection measures is discussed.