



Determination of spatial snow depth distribution on slopes using terrestrial laser-scanner

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The determination of the spatial snow depth distribution in potentially dangerous avalanche-starting zones is vitally important, both in terms of avalanche-prediction and design of permanent protection measures. Unfortunately, inaccessibility of the alpine terrain, as well as the acute danger of avalanches complicates snow depth measurements, for example when probes are used. Therefore, the possibility of measuring the snow pack using a terrestrial laser scanner was tested.

In use was the long-range laser profile measuring system Riegl LPM-i800HA. Without the use of a retroreflector, the scanner calculates the distance to the surface in question, based upon the time-of-flight measurement of a short laser pulse. In combination with a calibrated and oriented high resolution digital camera a hybrid sensor system was created. The measuring range is up to 800m, depending upon the weather-situation and the reflective condition of the snow pack. The wavelength is 0.9 μm (near infrared), the accuracy is typically within 30mm and the highest resolution is 1mm.

The objectives of the study are to examine which meteorological conditions, state of the snow pack and technical circumstances are favourable for accurate measurements. Additionally, the data generated by the scanner can be used to check GIS-applications.

The results of the measurements at test sites in the Austrian Alps are presented and the changes in snow depth and snow mass caused by snow drift or melting are discussed.