Geophysical Research Abstracts
Vol. 17, EGU2015-11713, 2015
EGU General Assembly 2015

Merging Terrestrial Laser Scanning Technology with Photogrammetric and Total Station Data for the Determination of Avalanche Modeling Parameters

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Dynamic avalanche modeling requires as input the volumes and areas of the snow released, entrained and deposited, as well as the fracture heights. Determining these parameters requires high-resolution spatial snow surface data from before and after the avalanche. In snow and avalanche research, terrestrial laser scanners are used increasingly to efficiently and accurately map snow surfaces and depths over an area of several km^2. In practice however, several problems may occur, which must be recognized and accounted for during post-processing and interpretation, especially under the circumstances of surveying an artificially triggered avalanche at a test site, where time pressure due to operational time constraints may also cause less than ideal circumstances and surveying setups. Thus, we combine terrestrial laser scanning with photogrammetry, total station measurements and field snow observations to document and accurately survey an artificially triggered avalanche at the Col du Lautaret test site (2058 m) in the French Alps. The ability of TLS to determine avalanche modeling input parameters efficiently and accurately is shown, and we demonstrate how, merging TLS with the other methods facilitates and improves data post-processing and interpretation. Finally, we present for this avalanche the data required for the parameterization and validation of dynamic avalanche models and discuss using newest data, how the new laser scanning device generation (e.g Riegl VZ6000) further improves such surveying campaigns.