Geophysical Research Abstracts
Vol. 19, EGU2017-15155, 2017
EGU General Assembly 2017

What does control debris-flow channel-bed erosion? A LiDAR-based change detection compared to velocity, momentum and pressure derived from a calibrated model.

Andreas Dietrich and Michael Krautblatter
TU Munich, Chair of Landslide Research, München, Germany (a.dietrich@tum.de)

Erosion capacity and bedrock incision of debris flows are poorly understood. Here we present a unique study of a recent debris-flow event (06/2015) in the Allgaeu Alps (Germany). More than 50 terrestrial laser scan positions (TLS) of a mountain torrent (1.2 km) have been used to detect geomorphic change by comparing the new elevation model to an airborne laser scan (ALS) performed in 2007.
It shows that the debris flow incised up to 4 m into the channel-bed, resulting in an erosion volume of 9.700 $\pm$ 1.600 m^3 and a deposition volume of 1.200 $\pm$ 300 m^3 in the channel. Errors were considered by a spatial variable threshold based on the point density of the ALS and TLS as well as the slopes of the DEMs.
A numerical single-phase model (RAMMS Debris Flow) was carefully calibrated with detailed field data. The derived velocity, pressure and momentum of the model were compared to the geomorphic change. It shows that all three parameters explain erosion by more than 50 %.
The results contribute to better define the possibilities and limitations of a combined TLS and ALS analysis for geomorphic change detection in complex terrain. The explanation of the erosion capacity with simulated parameters of a debris flow might be revolutionary for upcoming predictions of potential future debris-flow volumes.