Geophysical Research Abstracts,
Vol. 10, EGU2008-A-03473, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-03473
EGU General Assembly 2008

LiDAR based estimation of morphologic changes during a flood event and comparison with bedload transport volumes determined by a simulation model

M. Chiari (1) and D. Rickenmann (1,2)

(1) Institute of Mountain Risk Engineering, University of Natural Resources and Applied Life Sciences, Vienna, Austria (2) Swiss Federal Research Institute WSL, Birmensdorf, Switzerland

(Michael.chiari@boku.ac.at)

Sediment transport measurements are typically made at specific cross-sections and can often be obtained only at limited flow discharges. Besides the limited availability of such data they only provide information at a single point, representing the transport conditions of the upstream reach. Here we used airborne LiDAR data to determine the morphologic changes during an extreme flood event that occurred in August 2005 in Chiene stream in the Swiss Alps, for comparison with sediment transport calculations. These changes represent the time integrated transport conditions along the channel system resulting in reaches with net erosion or deposition. Two high resolution elevation models for the Chiene watershed are available. The first is from the year 2001 and the second was generated shortly after the flood event. The deposition and erosion volumes are calculated in reaches and are verified with aerial photos. During the considered time period no other major floods are recorded in the catchment which could have resulted in major morphologic changes. It is estimated that about 100 000 m^3 of bedload were mobilized during the flood event of August 2005.

A one-dimensional sediment transport model for steep torrent channel networks called SETRAC has been developed at the University of Natural Resources and Applied Life Sciences, Vienna. SETRAC is the acronym for SEdiment TRansport in Alpine Catchments. The simulation model applies a kinematic flow routing of the flood hydrograph

trough a channel network. Reach wise sediment stock can be considered. Three different flow resistance approaches and four transport capacity formulas appropriate for steep streams can be combined with two approaches to take into account the effect of losses due to form roughness. The model was used to calculate the bedload volumes that were mobilized during the extreme event which were then compared with the sediment volumes calculated from the comparison of the LiDAR based elevation models. This case study of an extreme event in the Swiss Alps demonstrates the models capability and limitations to compute sediment transfer in a mountain stream.