Geophysical Research Abstracts,
Vol. 11, EGU2009-10725-1, 2009
EGU General Assembly 2009

Enhancing debris flow modeling parameters integrating Bayesian networks

C. Graf (1), M. Stoffel (2), and A. Grêt-Regamey (3)

(1) WSL Swiss Federal Research Institute, Avalanches, Debris Flows and Rockfalls, Birmensdorf, Switzerland (christoph.graf@wsl.ch), (2) University of Berne, Laboratory of Dendrogeomorphology, Institute of Geological Sciences, Berne, Switzerland, (3) Swiss Federal Institute of Technology Zurich, Institute for Spatial and Landscape Planning, Planning of Landscape and Urban Systems, Zurich, Switzerland

Applied debris-flow modeling requires suitably constraint input parameter sets. Depending on the used model, there is a series of parameters to define before running the model. Normally, the data base describing the event, the initiation conditions, the flow behavior, the deposition process and mainly the potential range of possible debris flow events in a certain torrent is limited. There are only some scarce places in the world, where we fortunately can find valuable data sets describing event history of debris flow channels delivering information on spatial and temporal distribution of former flow paths and deposition zones. Tree-ring records in combination with detailed geomorphic mapping for instance provide such data sets over a long time span.

Considering the significant loss potential associated with debris-flow disasters, it is crucial that decisions made in regard to hazard mitigation are based on a consistent assessment of the risks. This in turn necessitates a proper assessment of the uncertainties involved in the modeling of the debris-flow frequencies and intensities, the possible run out extent, as well as the estimations of the damage potential.

In this study, we link a Bayesian network to a Geographic Information System in order to assess debris-flow risk. We identify the major sources of uncertainty and show the potential of Bayesian inference techniques to improve the debris-flow model. We model the flow paths and deposition zones of a highly active debris-flow channel in the Swiss Alps using the numerical 2-D model RAMMS. Because uncertainties in run-out areas cause large changes in risk estimations, we use the data of flow path and deposition zone information of reconstructed debris-flow events derived from dendrogeomorphological analysis covering more than 400 years to update the input parameters of the RAMMS model. The probabilistic model, which consistently incorporates this available information, can serve as a basis for spatial risk assessment.