



## **Integrated modelling of debris flows in the Central Andes based on Open Source GIS**

**M. Mergili** (1), W. Fellin (2), S.M. Moreiras (3) and J. Stötter (1)

(1) Institute of Geography, University of Innsbruck, Austria, (2) Institute of Infrastructure, University of Innsbruck, Austria, (3) IANIGLA, Mendoza, Argentina  
(martin.mergili@uibk.ac.at / +43 512-507-5427)

An integrated model framework, designed as a module for the Open Source GIS software GRASS, was developed for simulating the occurrence of debris flows as a response to extreme rainfall events. The tool is suitable for study areas of few square kms and includes the following modules:

- (1) Infiltration and surface runoff: water input from rainfall is distributed among vegetation, soil (Green-Ampt infiltration model), and surface runoff, which is calculated using the Manning-Strickler formula;
- (2) Sediment transport: detachment of soil by surface runoff is computed using a sediment transport model, and locations where runoff may evolve into a debris flow are identified;
- (3) Slope stability: an infinite slope stability approach is applied for identifying locations of potential slope failures which may contribute to debris flows;
- (4) Runout and deposition: empirical rules and equations are applied for estimating runout distance of the identified debris flow material as well as the patterns of deposition.

For defined rainfall events, the model framework was applied to some selected study areas along the international road from Mendoza (Argentina) to Central Chile. All necessary parameters were investigated on a local scale: Soil samples were taken in the field and analyzed for their mechanical characteristics. Hydrological characteris-

tics were derived using pedotransfer functions. High-resolution terrain models were generated from stereo imagery. The results of the scenarios were validated using historical archives and field observations.

Further development of the model framework will include particularly the implementation of a deterministic debris flow runout model, based on the Savage-Hutter concept.