ASSESSING FRICTION COEFFICIENTS IN FORESTS FOR ROCKFALL PROPAGATION MODELLING

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Within the frame of the project “Indicative Natural Hazard Maps in the Province of Styria” a GIS-based approach has been analysed aiming at the identification of areas which are potentially endangered by rockfall, considering the protective effect of forest. The study area is the Province of Styria, located in the southeastern part of Austria and covering approx. 16.400 km².

Potential source areas are identified using a slope angle threshold derived from ALS data. The mean block masses of each geotechnical unit, representing the most probable event, were classified according to field observations, resulting in three representative volume classes.

The run-out distances and propagation velocities are calculated on the basis of energy conservation of a mass that is considered to move over a slope surface as defined by Scheidegger (1975). In this approach, a friction coefficient is responsible for energy loss. For each cell in the falltrack, the velocity of the falling rock is calculated. The method is implemented as a random walk in conjunction with a Monte Carlo approach (Wichmann 2006).

Forest cover characteristics were taken into account for the estimation of the friction coefficient. This step was based on a detailed characterisation of forest parameters on basis of ALS and satellite data. An automatic segmentation to forestal units was performed resulting in a GIS database with a total of 6.9 million polygons. The following forest parameters were selected: (a) treetop number per unit area, (b) crown coverage, (c) height of upper layer and (d) vertical forest structure.

Friction coefficients were adjusted by calibrating modelled propagation areas with GPS measurements of rock fall boulders. This was done in an iterative process for each volume class in several representative test sites. Due to the fact that small rocks retard more easily than bigger rocks, for each volume class different friction coefficients were defined. These have been assigned to each of the forestal unit polygons. The model calibration procedure and model results are presented in the current contribution.