Geophysical Research Abstracts
Vol. 13, EGU2011-3654, 2011
EGU General Assembly 2011
© Author(s) 2011

Why are good process data so important for the modelling of landslide susceptibility maps?

Leonhard Schwarz and Nils Tilch

Geological Survey of Austria (GBA), Department of Engineering Geology, Vienna, Austria
(leonhard.schwarz@geologie.ac.at, www.geologie.ac.at)

In Austria, process data of gravitational mass movements are collected, stored and managed by various institutions. This data varies greatly with respect to quality, scope, and regional or partial completeness/randomness due to the different aims and responsibilities of the individual organizations. Apart from that, the status of data (scope, completeness) can be only moderate in relatively landslide-resistant and sparsely populated landscapes, whereas very good data are often available for landslide-prone and more heavily populated regions. Landslide inventories serving as a "memory" of previous events, are also used as data input in many kinds of model calculations, for example to produce susceptibility maps for landslides and rock falls.
Process-data requirements vary considerably, depending on the method used to model susceptibility maps. For heuristic methods (model type A), process data are only required for calibration and validation, whereas when using statistical models and neural networks (model type B), such data are also required as model training data. Hence the methods of model group A are generally more suitable for use on large-extended areas of heterogeneous landscape, for which the process data quality tends to be somewhat lower. On the other hand, sophisticated methods of the model type B are usually more suitable for small-extended areas of homogenous landscape, for which usually a higher data quality is existing. This raises the question of how different process data (with respect to data quality, volume, representativity, etc.) affect method-specific results and their validation.

In two areas (Gasen-Haslau, Styria, 60 km^2; Klingfurth, Lower Austria, 10 km^2) with very high process data quality, neural networks and the "simple heuristic GBA Method" were used to produce susceptibility maps for spontaneous mass movements in soil. These areas were chosen for study, because a relatively complete landslide inventory exists, based on extensive event documentation in the field and a comprehensive data archive.
Due to the high process-data density and the large amount of data, it was possible to progressively reduce the process-data volume. For the Gasen-Haslau region, this was done in the form of percentaged, randomly selected data reduction (from 80% to 5%), whereas for the Klingfurth region, three different originator-specific data batches were used.

It was established that in order to achieve high-quality results, methods that require training (for example neural networks) should be used. However, this presupposes good process data quality, because process data must also be used as model training data. With both methods, the dispersion of validation results increased as the amount of data decreased, particularly when using the neural networks method after data reduction to 40% (= 1.2 process points/km^2). Hence when dealing with poor data quality, both methods might be equally good or heuristic methods should be preferred. Good process data quality is also necessary for all methods, in order to validate results and make reliable quality statements. Significant, representative and preferably complete process data sets are required for both purposes, because without them, randomly good or randomly poor validation results are obtained. It is therefore obvious that on the whole, process data sets that are as complete as possible, collected for example in the course of area-wide and comprehensive event documentation, are highly important.

In future, similar studies will be done in other regions as well, in order to make quantitative statements on method-specific data requirements and their effect on the quality of results.