Evaluation of slow moving landslides in the Northern Walgau (Austria) using morphometric analysis techniques

Elmar Schmaltz, Stefan Steger, Rainer Bell & Thomas Glade
Department of Geography and Regional Research, University of Vienna, Austria

Rens van Beek
Faculty of Geoscience, University of Utrecht, The Netherlands

Thom Bogaard
Faculty of Civil Engineering and Geoscience, Delft University of Technology, The Netherlands

Di Wang, Markus Hollaus & Norbert Pfeifer
Department of Geodesy and Geoinformation, TU Wien, Austria

Landslides play a key role in landscape evolution in the Eastern Alps. These geomorphic phenomena are influenced by multiple interdependent and interacting natural and anthropogenic factors. An in-depth evaluation of the spatial distribution of existing landslides enables to gain first insights into potentially hazardous areas. Morphometric analysis techniques of mapped landslides as well as their date of occurrence allow to infer their activity and also potential impacts on affected areas.

The objective of this research is the geomorphometrical evaluation of landslides (e.g. dilation, flowage, tenuity, displacement) in the Northern Walgau while considering anthropogenic land use transformations from the last 60 years. The prevalent slow moving landslides and inactive slipping areas were mapped and analyzed via digital terrain models (DTM) and shaded relief images of highly resolved airborne laserscanning (ALS) data and in-field observations. Orthophotos from aerial surveys (1950s-2009) and ALS data (2004 and 2011) allowed a deferred-time analyses of past landslide occurrences including a record of recent slope movements. All mapped landslides were classified and analyzed with common landslide analysis techniques, such as geomorphometric indices. Moreover, pedological processes, the lithological setting and anthropogenic landscape transformation, such as de- and afforestation as well as infrastructural development, were taken into account when interpreting the results. The geomorphometrical evaluation of the sliding areas determine the creation of a multi-temporal landslide inventory in the Northern Walgau. Hence, the results of this study represent the basis for calibration and validation of further simulation and physically based modelling in the BioSLIDE project; within its framework this study is conducted. BioSLIDE aims to assess the impact of biomass and its changes derived from laserscanning data on slope stability by using physically based hydromechanical modelling at regional scale. Thus, the geomorphometrical issues of the mapped landslides yield important information about spatially distribution and dynamics of the landslide occurrences in the study area. Moreover, they were used as a validation for the synthetic hydromechanical landslide modelling.