LANDSLIDES AND SLOPE STABILITY ON THE FRANCONIAN ALB, NORTHERN BAVARIA

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INTRODUCTION

The ongoing climate change leads to increasing risks related to natural hazards. Landslides, as one of these hazards, are present in the South German low mountain areas such as the Franconian Alb.
The Franconian Alb is highly affected by landslides, primarily triggered by hydrological parameters and therefore by precipitation changes. For the years and decades to come, a rise in winter precipitation is predicted and thus an increase in frequency of the occurrence of mass movements in general along with higher risk potentials is assumed. According to these assumptions, larger amounts of damage for specific regions like the Franconian Alb can be expected. However, the occurrence of landslides in this area is poorly documented and there has been no susceptibility mapping carried out yet.

RESEARCH

In order to improve this situation, the Institute for Geography and Geology at the University of Wuerzburg has established a research project funded by the German Research Foundation (DFG) in 2011. Important aims are the comprehension of existing landslides as well as to analyze the external and internal controlling factors. All information is collected in a database under consideration of the landslide age and further attributes. Results of statistical calculations are the base for landslide susceptibility maps. Simultaneously, a cooperation with the Bavarian environmental State Office has been started in order to extend the existing GEORISK database of the Bavarian BIS (Boden-Informations-System) with data on the mapped landslides.

STUDY AREA

The distribution of the landslides on the Franconian Jurassic escarpment primarily depends on the geology and geomorphology of the hillslopes. The escarpment rises about 100-300m over its foreland and is formed by geological units from the Middle and Upper Jurassic. The valleys in front of the main escarpment mostly consist of impervious lower Aalenian clays (al1), covered by the upper Aalenian sandstones (al2). On top of these the slopes are built up by upper Callovian clays (cl), followed by Oxfordian limestones, lower Kimmeridgian marls (ki1) and middle Kimmeridgian limestones (ki2). Former studies (e.g. VON DER HEYDEN, 2004) emphasize a relation between these geological and other pedological or morphological parameters and the occurrence of mass movements. In general, especially the impermeable clays cause slope instability as water stagnation leads to reduced friction and therefore is able to initiate mass movements. The boundary between Middle (upper Callovian Clays) and Upper Jurassic (Oxfordian limestones) is most sensible to landslides.

METHODOLOGY

Although most of the landslides appear to be of an older age (posterior to the Last Glacial period), many of them affect the distribution and triggering of mass movements in form of secondary movements. This is due to the metastable conditions of unconsolidated material, making them vulnerable to further movement.

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In contrast to several works previously published (e.g. VON DER HEYDEN, 2004), this project aims to obtain an overview of the slope stability in northern Bavaria in general. Information about the different types, sized, dangers etc. are collected in a database. Furthermore, a large-scale mapping of this region is going to be elaborated, depicting the areas with mass movements.
Specific areas of interest are going to be investigated in detail. First and foremost, this includes several laboratory analyses of (physical) soil parameters like shear strength, density and plasticity. In areas with potential or active mass movements, a permanent monitoring of the occurring movements, the precipitation and the soil moisture is going to be installed in order to gain insight of the particular relation between rainfall and the changes in soil moisture. This process is supposed to be the most important factor triggering landslides- especially under the circumstances of increasing rainfalls due to climate change.

REFERENCES

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