The Sudelfeld landslide – first findings of the acquired monitoring data

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Due to possible aspects of climate change and the continuous extension of settlement areas in mountainous regions such as the Alps, landslide monitoring gained more importance in the last years. It became necessary to monitor more mass movements in order to minimize the conflict between land use and natural hazard prevention on the one hand and on the other to better understand their mechanisms and to be able to install adequate early warning systems.

A monitoring system, consisting of several different components – surveilling surface movements and subsurface deformations – has been installed at the Aggenalm landslide, situated in the Bavarian Alps near Bayrischzell in the context of the alpEWAS project (development and testing of an integrative 3D early warning system for alpine unstable slopes).

To be able to better understand the mechanisms and to rectify the numerical model of the Aggenalm landslide, a field mapping was conducted and geoelectrical profiles were surveyed. Drill cores at certain points also helped to understand the build-up of the mass movement. In these boreholes TDR (Time Domain Reflectometry) has been inserted to monitor subsurface deformations as have been two inclinometers. Furthermore, piezometers were installed to observe the pore water pressure. At the center station of the sensor network (GSN) a weather station collects precipitation, temperature and atmospheric pressure data. The observation of surface movements is accomplished by two different techniques, one being a video tacheometry (VTPS) system and the other GNSS (global navigation satellite system), which is placed at several nodes of the geo sensor network. The data of all of the GSN’s sensors are then forwarded to and saved in a database (Thuro et al. 2009).

To date the sensors have collected about 1.5 years of data (October 2008 to March 2010), allowing different analysis techniques, such as time series analysis to evaluate the data, thus being able to verify and/or refine the geomechanical model of the landslide and to contribute to a better understanding of the landslide’s triggers.

From prior landslide events at the Aggenalm and first results of the geomechanical model it is fancied that one of the major influencing factors on the movements of the slide is the precipitation. Therefore aim of the time series analysis has been to show and prove the dependency between precipitation, pore water pressure and deformation measurements.

First results of the time series analysis approve this assumption, showing a time delay between precipitation and rise in pore water pressure of about 2 days. The reaction time for the water pressure rise after the onset of snowmelt is greater (Singer et al. 2009). Further analysis will be conducted, verifying these first results over a longer time span and concentrating on the comparison with deformation data.

References
