Geophysical Research Abstracts,
Vol. 10, EGU2008-A-10030, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-10030
EGU General Assembly 2008

Landslide monitoring and modelling within the Integrative Landslide Early Warning Systems (ILEWS)

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Landslides cause fatalities and economic damage worldwide. Installing early warning systems is one option to reduce severe consequences. The aim of the study presented here is to design and implement a prototype of an integrative early warning system for known and reactivated landslides, so that information on potentially catastrophic failures can be collected in advance. The system configuration is modular and transferable and could also be applied to other study areas or different natural processes.

The early warning system is based on the three parts: Monitoring (measurement, data transmission), Modelling (historical and current frequency and magnitude determination, early warning modelling) and Implementation (information management, cooperative risk communication, coordination of early warning risk with other elements of an integrated risk management). This presentation highlights the technical instrumentation used for monitoring and modelling by the ILEWS project. The study area is located in the Swabian Alb, Southwest Germany, on a historically active landslide. The preceding project InterRISK documented an extremely slow movement of 0.8 mm in 2.5 years which was initiated by strong summer rainfalls and snow melting in spring.

The early warning concept consists of a physically-based Near Real Time Early Warning Model and a Surface Movement Analysis Early Warning Model. Within the

physically-based Near Real Time Early Warning Model continuously measured data from a permanently geoelectric device, a weather station, TDR probes and tensiometers are integrated into CHASM (Combined Hydrology and Slope Stability Model) to calculate slope stability and results are presented in a WebGIS application. Data transmission from the field is wireless and based on the Scatter Web technology. If the stability index crosses specified thresholds a warning message is provided in the WebGIS and SMS are send to the involved scientists. Within the Surface Movement Model all measured movement rates from inclinometer chains, mobile inclinometers and high precision geodetic surveys are analysed using the approach of "progressive failure" by Petley et. al (2005). In a last step it is investigated if both models can automatically support each other.

In the end an autarkic running model will be set up which controls itself to some degree and only has to be supervised by experts. The transferability of the developed model will be tested in a study area in South Tyrol.