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The Salcher landslide observatory: a new long-term monitoring site in Austria

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Landslides pose a significant hazard in the federal district of Lower Austria. The Geological Survey of Lower Austria is responsible for detailed site investigations as well as the planning and installation of protective measures. The most landslide prone area in Lower Austria is within the Rhenodanubian Flyschzone whose materials consist of alterations of fine grained layers (clayey shales, silty shales, marls) and sandstones. It exhibits over 6200 landslides within an area of approx. 1300 km^2. For areas susceptible to landsliding, protection works are not feasible or simply too costly. Therefore, monitoring systems have been installed in the past, most of them, however, are not operated automatically and require field visits for data readouts. Thus, it is difficult to establish any relation between initiating and controlling factors to gain a comprehensive understanding of the underlying process mechanism that is essential for any early warning applications.

In this presentation, we present the design and first results of an automated landslide monitoring system in Gresten (Lower Austria). The deep-seated, slow moving Salcher landslide extends over approx. 8000 m^2 and is situated adjacent to residential buildings and infrastructure. This monitoring setup is designed to run for at least a decade to account for investigations of long term sliding dynamics and pattern. Historically the Salcher landslide has shown shorter phases with accelerated movements followed by longer phases with barely any movements. Those periods of inactivity commonly exceed regular project durations, thus it is important to cover longer periods. Such slope dynamics can be investigated throughout many parts in the world, thus this monitoring might allow to understand better also landslides with infrequent movement patterns.

The monitoring setup consists of surface as well as subsurface installations. All installations are connected to permanent power supply, are taking the respective reading at a fixed time interval and are embedded within a WiFi network. All measured data is sent immediately to a server in Vienna and thus, all information is available in real-time. Surface monitoring devices cover a meteorological station measuring rainfall, temperature, radiation and air pressure and a permanent long-range Terrestrial Laserscanning (pTLS) station performing a high resolution scan of the entire landslide surface once a day. The subsurface devices include TDR probes and a fully automated geoelectrical monitoring profile for analyzing the spatial distribution of resistivity changes (attributed to changes in soil moisture) over the entire length of the landslide. Along this longitudinal profile, four piezometers are installed to monitor groundwater fluctuations. This is accompanied by an automated inclinometer chain for assessing horizontal displacements in the subsurface.

The presentation will focus on the first results of the monitoring system and will highlight ongoing and future work tasks including data processing, analysis and visualization within a web-based platform. The overall goal of the described system is to enable authorized users and decision makers to utilize real-time data and analysis results to issue alarms if potentially hazardous changes are recorded.