



Seismic monitoring of slope dynamics caused by a slow-moving landslide in the Vorarlberg Alps, Austria

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Our work within the research unit 'Coupling of flow and deformation processes for modeling the movement of natural slopes' is mainly focused on the monitoring of seismic signals caused by the movement of the Heumoes slope in the Vorarlberg Alps, Austria. The slope is set up by loamy scree and glacial till, mostly clayey material with embedded hardrock components of varying size, and moves with several cm per year at the surface (Lindenmaier et al. 2005, Hydrological Processes). During several field campaigns within the last three years we were able to detect and locate single fracture processes during the movement of the Heumoes slope by applying seismic mini-array techniques.

Dozens of fractures with magnitudes varying between $-0.7 \leq ML \leq -2.4$ have been detected and located. The spatial distribution of the epicentres correlates with slope areas of higher movement rates. The epicenters are mainly clustered in the western part of the slope, while no events have been located in the eastern part. By contrast to the slope material of the eastern part of the slope, the water saturation of the slope material of the western part varies with the season. We therefore preliminary assume, that the recorded fractures have been generated in dependence of the water saturation of the unstable sediments. This assumption has been confirmed by in-situ field experiments within dried sediments in Israel, which will be presented.

The temporal occurrence of the detected fractures, up to 26 hours after intense rain events, seems to approve the assumption of a rainfall-triggered movement of the slope caused by fast subsurface water dynamics.

The statistical significance of the spatiotemporal occurrence of the fractures has been investigated within a one month lasting field campaign in August 2008, where five mini-arrays have been installed to monitor the dynamics of the whole slope. The first findings of these investigations will be presented.