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# Permanent seismic monitoring of fracture processes caused by fast water infiltrations at the Heumoes slope, Austria

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Within the research unit 'Coupling of Flow and Deformation Processes for Modelling the Movement of Natural Slopes", we investigate the spatio-temporal occurrence of fracture processes at the slow-moving Heumoes slope, Austria, applying the method Nanoseismic Monitoring. As the Heumoes slope consists of weak sediments and the material properties therefore vary with the season, we installed a seismic network consisting of three seismic small-arrays in July 2009 to monitor the slope dynamics permanently.
Since then, we observed more than 70 fracture processes caused by deformation processes of the unstable slope material. Their temporal occurrence correlates well with the snow-melting periods in spring and strong rainfall-events in summer, indicating initial changes of the state of stress by fast water infiltrations which lead to the generation of fracture processes. These observations are supported by parallel measurements of the slopes movement. The inclinometer devices in different depths also recorded the highest movement rates after snow melting periods and strong rain events, but they don't correlate directly with the temporal occurrence of the seismically registered fracture processes. We assume, that the inclinometer devices record the flow of water saturated material for a longer-running time-period, while the occurrence of the fracture processes mark an initial stress relief within the unstable material. As the unstable Heumoes slope consists of weak sediments, the generation of measurable fracture processes or stress relief takes place as a function of the water saturation of the slope material.
Additional geophysical investigations by partners of the research unit show, that the areas where most of the fractures are located, are dominated by a significant raise of the bedrock topography in the subsurface. These areas obviously cause an accumulation of tension resulting in brittle failure deformations (in time-periods where the slope material is not water-saturated) compared to areas where the slope material is minor influenced by the bedrock topography and can flow without any barriers (in time-periods where the slope material is water-saturated).
The comprehensive analysis of the spatio-temporal occurrence of fracture processes observed by permanent seismic monitoring as well as the embedding of these results in the comprehensive model of the complex behaviour of the Hemoes slope by the entire research unit will be presented.