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Seismic monitoring of soft-rock landslides: New case study at Pechgraben mudslide - Upper Austria

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Creeping soft-rock landslides trigger various seismic signals which relate to key dynamics of the slope instability. A new seismic monitoring study is carried out at Pechgraben - Upper Austria, where a clay-shale rich mudslide was reactivated in summer 2013 after heavy rainfalls. The well geophysical instrumentation of the Pechgraben mudslide by the Geological Survey of Austria (LAMOND network including permanent ERT, GPS, piezometers, soil temperature/humidity and photomonitoring) is expected as a better basis for joint interpretation of seismic source processes. Seismic data are acquired by small-aperture (< 30 m) sparse seismic arrays. Potential events are recognized by frequency-time signatures in sonograms, where sonograms are spectrograms featuring a frequency-dependant noise adaptation that enhance the display of weak signal energy down to the noise threshold. Further signal evaluation follows an interactive scheme where semi-automated beam forming method enables for approximate source location. Three seismic arrays where deployed at Pechgraben in October 2015 for an eight days feasibility study. About 200 seismic signals potentially triggered by the landslide were manually picked on nighttime measurements. Target signals occur in tremor-like sequences and have duration within 1 – 8 seconds. Local magnitudes are calibrated down to ML -1.5 (Wood-Anderson amplitude $\approx$ 0.1 μm in 100 m distance). Observed waveforms display high degree of similarity with seismic signals catalogued at other soft-rock landslides suggesting that a general typology of seismic source processes could be established for creeping soft-rock instabilities with potential further implications in landslide mitigation and forecasting.