Pore Water Pressure & Landslide Acceleration: Insights from long-term monitoring in Lower Austria. A case study of the Hofermühle landslide

Yenny Alejandra Jiménez Donato[1], Thom Bogaard[2], Edoardo Carraro[1], Philipp Marr[1], Robert Kanta[1], Thomas Glade[1]

[1]University of Vienna, Geography and Regional Research, ENGAGE - Geomorphological Systems and Risk Research, Vienna, Austria (alejandra.donato@univie.ac.at

[2]Department of Water Management, Delft University of Technology, Delft, The Netherlands

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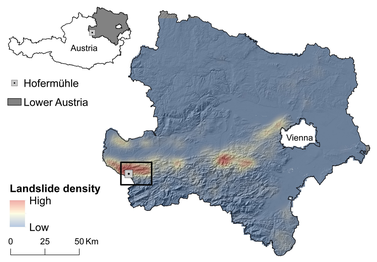
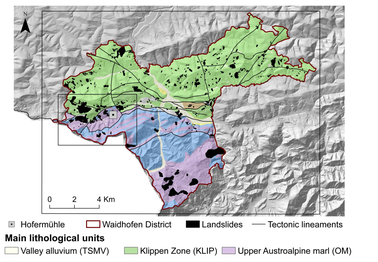
Landslides in Lower Austria



Thousands of landslides were mapped in the region by 2014 (**13,165**).

Landslides from Petschko, et al., 2014

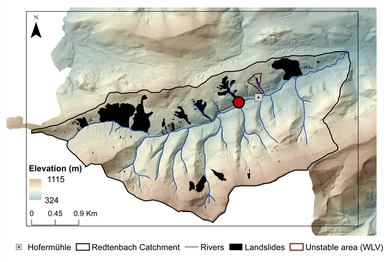
Waidhofen a.d. Ybbs



Complex geological transitions and heterogenous lithologies.

Geology from Geological Survey of Lower Austria

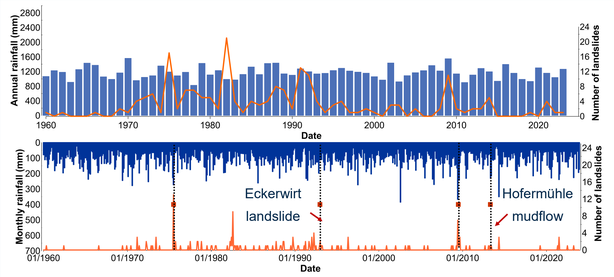
Redtenbach catchment



High landslide susceptibility conditioned by S-SE slope directions.

Landslides from Petschko, et al., 2014

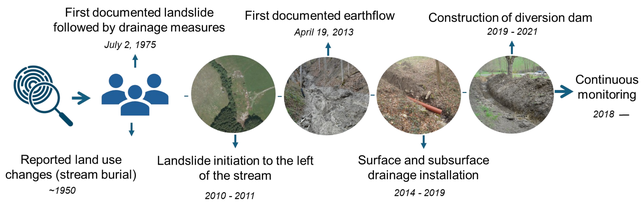
Is rainfall the main trigger of landslides?



Objective: To investigate the **hydromechanical behaviour** of a selected landslide in Lower Austria.

The Hofermühle "socio-natural" landslide

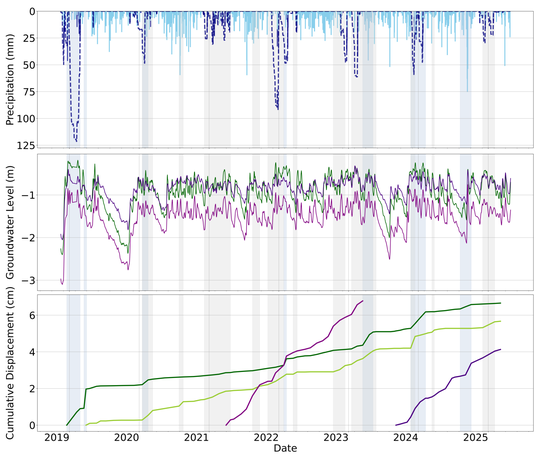
1. Forensic analysis and interview process with residents



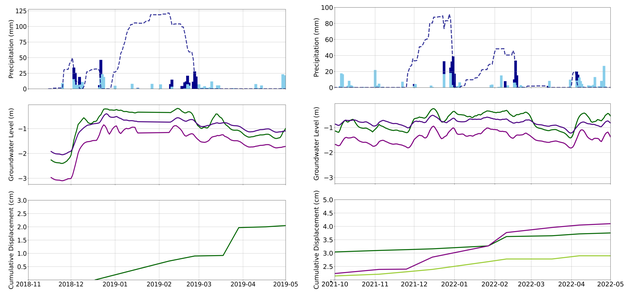
Exemplary case study of complex **lithological and anthropogenic** conditions. *Source: Federal State Government of Lower Austria, The Austrian Service for Torrent and Avalanche Control (WLV) and the residents of Hofermühle.*

Landslide acceleration analysis

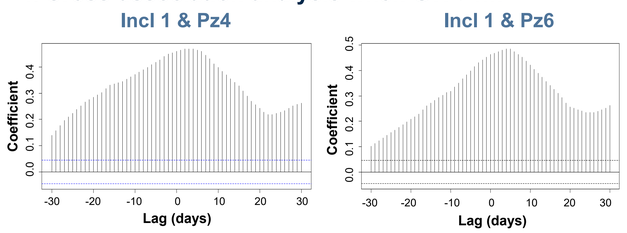
3. Time series analysis: Investigating the role of snow-melting and rainfall in landslide acceleration.



Snow pack and snow-melting estimation: Degree-day method calibrated with aerial and wild-life camera imagery.

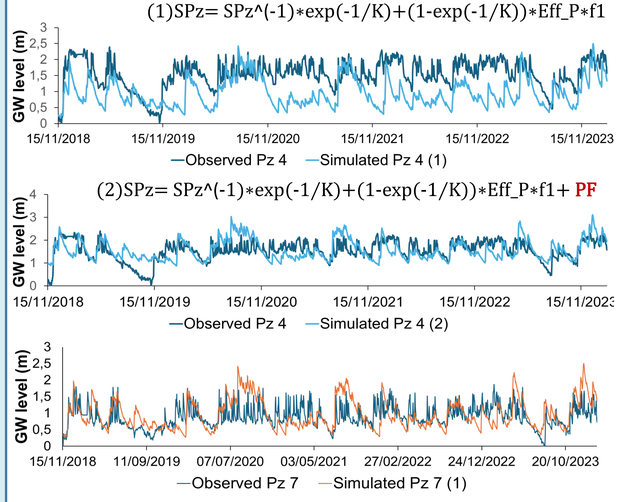


4. Cross-association analysis when GW >1m



Hydrological conceptual model

5. Linear Reservoir Model



F1= 0.4

K = 30

PF = 0.02*Eff_P

SPz = Simulated groundwater level.

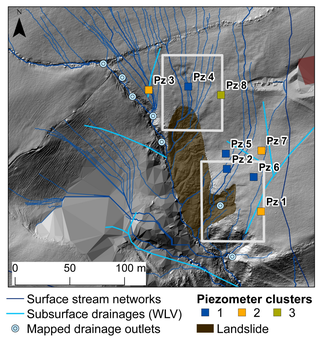
K = Storage coefficient.

Eff_P = (Rain water + snow melt) - PET

f1 = Infiltration factor

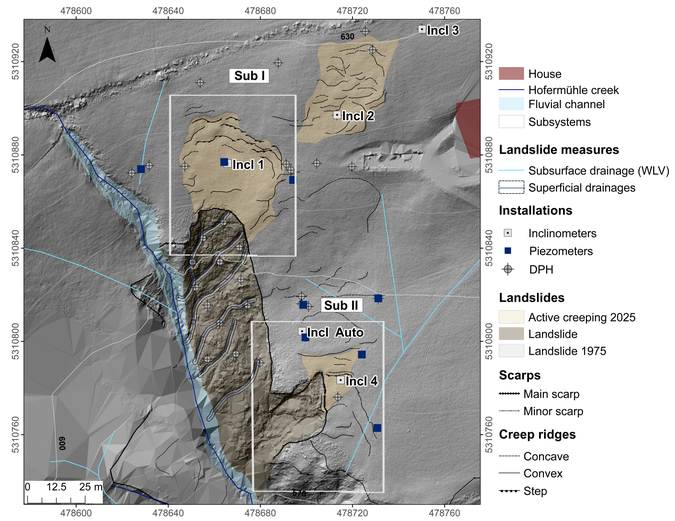
PF= Additional fraction from Eff_P when the temperature is lower than 8°C.

Preferential flow patterns



The Hofermühle landslide monitoring system

2. Long-term monitoring data analysis

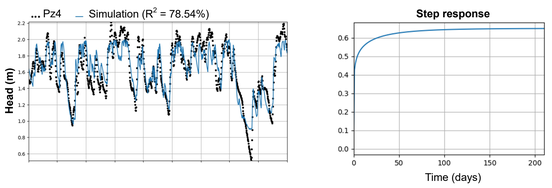


Predominantly loamy clayey soils.

Sub I—Incl 1: Sliding surface located at 3.5m (1.2 cm/yr)

Sub II—Incl 4: Sliding surface located at 2m (4 cm/yr)

6. PASTAS modelling and next steps



Development of hydrometeorological threshold models for LEWS.

Key points

Differential mechanical response of each subsystem.

Pore water pressure change plays an important role in landslide accelerations in both subsystems.

Non-linear temporal and kinematic responses to rainfall and snowmelt.

Dry antecedent conditions and secondary permeability are crucial to better understand hydromechanical dynamics of the Hofermühle landslide.

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