

Added value of soil moisture measurements for landslide early warning



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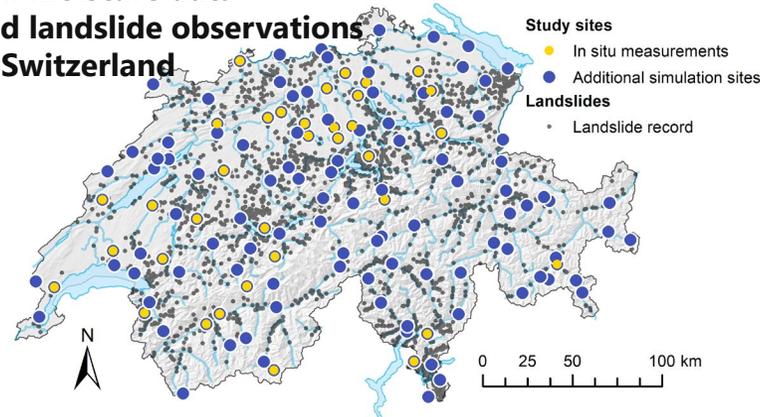


Swiss
Landslide
Database

Methodology

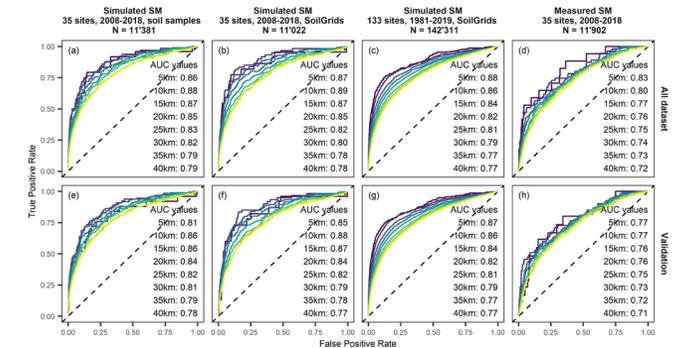
- In-situ soil moisture measurements, hourly time resolution, at 35 locations across Switzerland (2008–2019).
- Simulation of soil moisture dynamics at the same sites [plus in a second step 98 additional locations] using a physically-based 1D soil moisture transfer model (CoupModel, Jansson et al. 2012).
- For both measurements and simulations, individual infiltration events were identified, delimited and characterized by specific event properties.
- Infiltration events were classified as “landslide triggering” or “non-triggering”
- A statistical framework was applied to fit an empirical landslide forecast model, and ROC analysis was used to assess the forecast goodness.

Soil moisture data and landslide observations in Switzerland



Results and conclusions

- Existing in-situ soil moisture measurements can be used to assess the imminent regional landslide danger.
- The information content is mainly dependent on the distance between landslide and monitoring site.
- The landslide forecast model based on simulated soil moisture performs similarly as the measurement-based forecast model.
- Compared to using measurements, the simulation-based forecast model performs worse at reproducing antecedent saturation conditions. This could potentially be improved by better knowledge on soil hydrological properties.

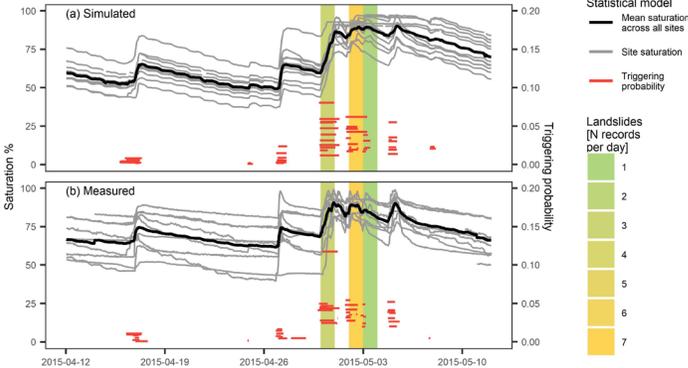


Publication
Simulated or measured soil
moisture: Which one is adding
more value to regional
landslide early warning?



Rationale

Regional Landslide early warning systems (LEWS) are cost-efficient and effective elements of integral risk management to alert people at risk and to move them to safety (Stähli et al. 2015). Several operational LEWS exist around the world. Many of them are based on triggering threshold models which empirically relate the occurrence of landslides to rainfall intensity and duration (Guzzetti et al. 2008). While rainfall measurements are available in increasing spatial resolution, using rainfall thresholds and rainfall-based indices for regional LEWS bears specific limitations. A few studies have shown that false and missed alarms could be significantly reduced if direct measurements of soil wetness, catchment storage or groundwater levels would be additionally included in LEWS.



More information on
the research project:



Publication
Assessing the potential of soil
moisture measurements for
regional landslide early warning



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