EGU23-13400, updated on 27 Feb 2024
https://doi.org/10.5194/egusphere-egu23-13400
EGU General Assembly 2023

The role of rainfall infiltration on landslide occurrence at regional scale

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The rain that falls during or after rainy periods is one of the major triggers for landslides. It is crucial to account for the infiltration not only on the time of landslide occurrence but also days/weeks/months in advance, especially in areas with high amounts of antecedent and triggering rainfall such as in tropical climates.

We used a physically-based model called “Fast Shallow Landslide Assessment Model” (FSLAM) (Medina et al., 2021) to map landslide susceptibility in the area of Itogon (Benguet, Philippines), often affected by Multiple-Occurrence Regional Landslide Events (MORLEs, Crozier, 2005). The model uses a simplified hydrological model and the infinite slope theory. The main input data are soil properties, vegetation, terrain elevation and rainfall maps.

We analysed changes in landslide susceptibility between two very intense rainfalls that did not trigger MORLE and Typhoon Mangkhut (2018) that did trigger a MORLE in the area. The results show that two main parameters control the instability of the slopes are: water recharge below the top soil layer before the event and the available pores volume (fillable porosity) in the soil at the time of the event. When the fillable porosity in the soil was lower, the landslide susceptibility increased and it was more likely to trigger a MORLE (case of Typhoon Mangkhut, 2018). On the contrary, if the soil had more fillable porosity (less saturated), the probability of MORLE occurrence is lower, no matter how high the rainfall intensity during the event is.

The findings of this work highlight that new approaches to develop hydro-meteorological thresholds for landslide early warning purposes should be evaluated, especially in tropical regions.

Crozier, M.J. Multiple-occurrence regional landslide events in New Zealand: Hazardmanagement issues. Landslides 2, 247–256 (2005).

https://doi.org/10.1007/s10346-005-0019-7

Medina, V.; Hürlimann, M.; Guo, Z.; Lloret, A.; Vaunat, J.; Fast physically-based model for rainfall-induced landslide susceptibility assessment at regional scale, CATENA, 201, 105213 (2021), https://doi.org/10.1016/j.catena.2021.105213.