

## Can we define hydro-meteorological triggering thresholds of landslides at catchment scale?

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Rainfall represents the most common landslide triggering factor frequently causing socio-economic loss. The most commonly used empirical rainfall thresholds are based on meteorological information only, and do not directly consider the hydrological factor. A review of existing methods tells that catchment-based hydrological information is rarely considered to be included in regional hazard assessment.

The objective of our work is to introduce lumped hydro-meteorological hazard assessment and discuss its applicability by analysing the advantages and disadvantages compared to the existing lumped PID methodology based solely on meteorological information. The work investigates catchment hydrological conditions and rainfall characteristics to look for relationship between both hydrological and meteorological conditions and the occurrence of landslides. The main idea is that catchment hydrological conditions can be assessed and used as an explanatory factor in regional landslide hazards assessment.

We analysed several catchments with known historical landslide occurrence using stream discharge data and meteorological information. The study describes catchment hydrological state using river discharge data with descriptors like FDC, run-off coefficients, BFI and others. Moreover, when possible, the water balance of the catchment is calculated on a daily time scale using a straightforward water balance approach using measured precipitation, discharge and evaporation. Then we compare different hydro-meteorological triggering thresholds using several hydrological proxies with the more classical precipitation-intensity-duration plots. We discuss the strength and weaknesses of this approach and link that to specific geomorphological conditions per catchment and landslide types. Finally, we give recommendation on how hydro-meteorological triggering thresholds could be used in day-to-day practice for regional landslide hazard assessment and early warnings.