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An analysis of including hydrology in rainfall intensity-duration thresholds to improve regional landslide hazard assessment

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Regional landslide hazard assessment is mainly based on empirically derived precipitation-intensity-duration (PID) thresholds. Generally, two features of rainfall events are plotted and labelled with (shallow) landslide occurrence or non-occurrence. Hereafter, a separation line is drawn, mostly in logarithmic space. The conceptual idea is the assumption that precipitation information is a good proxy for both meteorological trigger and hydrological cause. Although successfully applied in many case studies, it does suffer from many false positives as well as limited physical process insight. Some first steps towards a more hydrologically based approach have been proposed in the past, but these efforts seemed to get limited continuation. The main aim we have with this research is to increase the representation of the underlying hydrology in landslide regional hazard assessment. Hereto, we follow two paths. First, an empirical approach in which we use selected case studies to include hydrological information into the regional landslide hazard assessment, such as catchment discharge, catchment water storage, hillslope/soil water storage, soil hydraulic behavior and so on and to assess if including hydrological information has added value for the regional landslide hazard assessment in terms of predictive capacity and decreased amount of false alarms. Second, we follow a more theoretical hydrometeorological analysis of PID curves.
We will present theoretically as well as empirically derived hydrometeorological thresholds for landslide hazards, addressing examples where adding hydrological information is relatively straightforward, but also situations with important practical barriers and limitations to the proposed approach.