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A framework to evaluate future changes in shallow landslides under the effect of climate changes

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Rainfall severity in terms of potential damage strictly depends on the intensity and duration of the events and geomorphological features of affected areas. A quantification of the potential variations induced by climate changes (CC) in precipitation patterns triggering shallow landslides hazard represents in many geomorphological contexts a preeminent issue. Such phenomena are generally induced by heavy rainfall events lasting few hours requiring data at hourly or sub-hourly scale. Unfortunately, current climate models (also if downscaled through dynamical or statistical approaches) are recognized providing reliable precipitation data until the daily scale. To improve the understanding about how CC could affect the frequency and magnitude of very localized geo-hydrological phenomena bridging the mismatch between the outputs provided by climate models and the small scale (spatial and temporal scale) at which impact analysis has to be performed, in recent years, several simulation chains adopting statistical and stochastical methods have been proposed. Specifically, in this work, Bartlett-Lewis approach calibrated starting from daily precipitation statistics, as proposed by Bo et al. (1994) [10.1029/94WR02026] is used. Then, in this work, first aim concerns the understanding of approach capabilities to capture the physical structures of storms at fine time scale starting from daily outputs. After this, comparisons among critical rainfall thresholds (CTR) for shallow landslides inception and intensity duration (ID) curves based on disaggregated rainfall data provided by bias-corrected RCM simulations have been performed on current period to validate the approach. The above mentioned CTRs represent the couples of ID for which a given hazard level in terms of percentage of the "unstable" basin has been simulated as performed by Papa et al. (2013) [10.5194/hess-17-4095-2013]. Finally, the same approach is used on future time span to assess the potential variations in occurrence and magnitude of shallow landslide. The approach is tested on a small basin on Amalfi coast (southern Italy). Basing on available basin scale critical rainfall thresholds, the paper outlines how the projected changes in precipitation patterns could affect local slope stability magnitude scenarios with different due to investigated time horizon and concentration scenario. The work also reports qualitative evaluations on the future effectiveness of the local operative warning system in a climate change framework.