



The estimation of empirical rainfall threshold lines for the initiation of shallow landslide constrained by geostatistical rules

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This contribution is devoted to propose a procedure to reduce the uncertainty in estimating empirical rainfall threshold lines (ERTL) for the initiation of shallow landslides. Since Caine's study in 1980, the ERTL was proposed based on expert judgment in selecting the following crucial items: (1) the nearest rain gauge where measuring the rainfall height that initiated the shallow landslide; (2) the rainfall duration needed to trigger the mass movement (that is the difference between the time of the landslide initiation and the time of the effective rainfall initiation). The full subjectivity has been partially overpassed through a new automatic procedure (Vessia et al. 2014; Vessia et al. 2016) that enables not expert users to calculate the rainfall duration, provided that the time of the landslide initiation is known. Unfortunately, the rain gauge choice cannot be easily automated due to the variable pattern of rainfalls (convective rainfall, cyclonic/frontal rainfall, orographic/relief rainfall) that makes quite difficult, even for experts, to select the most representative rain gauge if it is not located nearby the landslide place. Thus, in order to tackle the challenging task of optimizing the choice of rain gauge station for tracing ERTLs, the writing authors started from the territory of the Abruzzo Region (Italy), where 58 rainfall stations have been recording the rainfalls every 1, 5 or 15 minutes since 2008. Then, the time series of rainfall within the last ten years have been studied through multivariate geostatistical tools, considering geomorphological criteria and catchment characters in the analysis, in order to draw rules for selecting the most representative rain gauges according to the place of the landslide and the type of the rainfall. Such territorial rules have been joined to the selecting criteria already developed to reduce the uncertainty in reconstructing the empirical rainfall threshold lines at regional scale.

References

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