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Effects of earthquakes and antecedent droughts on landslide initiation in Italy

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Earthquake and antecedent drought (drought for short) play important roles in triggering landslides, which change the formation condition of landslides by affecting topography, loose solid materials and water content. However, in most cases, landslide early warnings rely on rainfall thresholds or/(and) soil moisture conditions, without considering the effects of earthquake and drought. In this study, an analysis has been carried out on the latest version of Parametric Catalogue of Italian Earthquakes (Italian acronym CPT115) and standardized precipitation index (SPI) (to represent droughts) and the landslide events in a northern Italian region in the past 116-years period 1901-2016. Based on the quantitative analysis on the relationship in time between landslides, earthquake activities and drought events, the interacting relationship between landslides, seismic activities and droughts were explored. It has been found that the impacts from earthquakes and droughts on landslides do exist. The impacts from earthquakes in the study area was less significant comparing with other regions (such as Wenchuan, China), and droughts play a complementarily minor role on landslides. Finally, a method is proposed for predicting the landslides based on early earthquake and drought monitoring and used on some cases. We expect this study can provide useful information for combining earthquake and drought in the landslide early warnings.