



Natural and anthropogenic phenomena affecting the historical landslide trend in the Subappennino Dauno (southern Italy)

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The aim of this work is to present a methodology, based both on the use methods of time series analyses and of geospatial analyses of monthly climatic data (rainfall, wet days, rainfall intensity, and temperature), annual maximum of short-duration rainfall (from 1 hour to 5 days), historical modification of land use, and population variations in order to characterise the effects of these variables on the occurrence of landsliding in Daunia area, located on the eastern margin of the Southern Apennines thrust belt (southern Italy). Rock strata (mainly) interbedded with clayey marls, clays and silty-clays outcrop in this area. Due to the intense strain history, these successions are found to be from stratified to deeply fractured, up to be disrupted and floating as blocks in a clayey matrix. In turn, the clay units are laminated to intensely fissured and characterised by very poor mechanical properties (Santaloia et al., 2012).

The statistical analyses deal with data coming from published databases, integrated by public and private documents, referring to a wide time span. Climate data records from 1877 to 2008 were elaborated, in particular the data coming from sixteen rainfall gauges, ten of which were also thermometric. Moreover, some monthly indices of rainfall, wet days, rainfall intensity, temperature, and landslide occurrence were introduced to simplify the analysis of parameters, characterised by spatial and temporal variability. The population records are from the 19th century up to now while the time period of reference for the land use data is from 1930 up to now.

As concerns the landslide events, they were collected from 1918 to 2006. The main source of these records is the AVI database, an existing Italian database that collects data about damaging floods and landslides from 1918 to 1996. This dataset was integrated up to 2006 by consulting newspapers, scientific publications, technical reports, written by the researchers of the CNR-IRPI for the Civil Protection, and also documents belonging to a research project (PS_119; Cotecchia et al. 2010). According to the landslide data collected, the landslide events resulted to be 175 in the study area.

The trend analyses show that the landslide occurrence was increased with the time, despite of the rainfall and temperature data are not prone to landsliding. As a matter of fact, the trend of both the monthly rainfall and the rainfall intensity decreases, and the temperature and the wet days show a positive trend during the period of reference. The trend of the short-duration rainfall results generally to decrease.

Not existing an evident relationship between climate variability and the increase of landslide occurrence, some other factors should be considered, as, for instance, the poor mechanical soil properties, the role of anthropogenic modifications and the mismanagement of risk-prone areas. In this regards, the preliminary results obtained from the data analyses of the land use and the populations could partly justify the increasing trend of landslide occurrence.

More details on previous results of this research activity were recently published (Cotecchia et al., 2010; Polemio and Lonigro, 2011 and 2013; Santaloia et al., 2012).

References

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