Comparison of climatic indices with landslide occurrences in Calabria (Southern Italy)

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The most frequent and widespread landslides all over the world are induced by prolonged or heavy rainfall events. These phenomena often cause casualties and damages. Recent research on climate change has evidencing the link between the rainfall tendencies and the increase of damaging geohydrological events. This study has been carried out in the ambit of the EC Project INDECIS, whose aim is to develop an integrated approach to produce a series of climate indicators aimed at the high priority sectors of the Global Framework for Climate Services of the World Meteorological Organization (agriculture, risk reduction, energy, health, water), with the addition of tourism. The study area is Calabria, a region of Southern Italy frequently affected by mass movements and characterized by a highly variable climate. In this study, landslide occurrences in the period 1990-2018 have been collected for the whole territory of Calabria, and clustered according to the five provinces of the region. Moreover, 13 rainfall-based climatic indexes, among those proposed in the INDECIS project, have been calculated for each of the 79 rain gauges presenting complete and homogeneous databases. For each province and for the whole Calabria, the average and the maximum values of the climatic indices have been compared with the landslide occurrences in each year. The comparisons showed the best agreements with the following climatic indices: a) the total annual precipitation (RTA), the annual count of days when daily precipitation amount ≥ 10mm (R10mm), the annual count of days when daily precipitation amount ≥ 20mm (R20mm), the annual total precipitation when daily rainfall is greater than 95th-percentile (R95TOT) and, secondarily, the annual count of days with daily rainfall >= 50 mm (D50mm). For the best matches, the curves interpolating the two databases have been also drawn. The obtained results can be useful to predict the impacts that tendencies of rainfall indices patterns can have on slope stabilities of the territory.