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Temporal distribution of floods and landslides in Portugal (1865-2010)

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Hydro-geomorphological events are the natural hazards that most affect Portugal. Under the DISASTER research project, was created a GIS database (DB) about floods and landslides that occurred in this country, from 1865 to 2010. The inventory of these processes was based on a systematic compilation of national and regional newspapers articles, focusing occurrences with direct consequences on the population, i.e. those that implied killed, injured, missing, evacuated or displaced people, independently of the number of affected and the economic value of damage. The main objective of this DB is to support the development of risk studies related with these events, analysing their spatial and temporal distribution, the susceptibility of the territories and the vulnerability of the exposed elements. It is essential for risk management, providing a decision support for spatial and emergency planning.

This study aims to analyse the temporal rhythm of floods and landslides that occurred in the above mentioned period, as well as its evolutionary trend and the relationship between these processes and the precipitation, the main triggering factor of hydro-geomorphological events in Portugal mainland. The trends are analysed using the nonparametric Mann-Kendall (M-K) and Theil-Sen statistical tests (B), in order to estimate its magnitude.

The results show that from the 1903 records integrated in the Disaster DB (in the 145 years under analysis), 85.2% of occurrences correspond to floods and 14.8% to landslides. Until 1935 the number of occurrences per year is less than 10 (except 1909), but after this date there was a significant increase of this value, mainly in the years of 1936, 1966/67, 1979, 1996 and 2001, with more than 50 occurrences/year. In the period between 1935 and 1975, the mean number of occurrences is 22.5/year, but between 1975-2010 it changes to 16.5. The results suggest the absence of a statistically significant increasing trend of occurrences, during all the analysed period. Instead, these processes seem to report a cyclical behaviour considering different time scales, evidenced also by the precipitation data, highlighting the period from 1935 to 1975, with the highest number of occurrences. In fact, the mean annual precipitation (MAP) and mean daily intensity (MDI) variables also seem to reveal a cyclic trend, corresponding the years with the highest number of occurrences to those with higher MAP and MDI values, although more prominent in the latter one (except in 1909), evidencing the influence that precipitation has on the floods and landslide processes.