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A methodological approach to assess the severity of historical damaging hydrogeological events

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We present a methodological approach to assess the severity of Damaging Hydrogeological Events (DHEs), defined as rainy periods affecting wide regions for several days, and during which landslides and floods cause economic damage and fatalities. A DHE is the result of a triggering rainfall event affecting a region and causing damaging phenomena, as river floods and mass movements, on its territory. The methodological approach, thus, is founded on the historical series of both triggering rainfall and resulting damage.
For the DHE that occurred in Calabria (Southern Italy) during the last 100 years, we assessed some severity indicators of both the damage and the daily rainfall recorded. Using these indicators, we built a chart where the events can be plotted and classified, according to their magnitude, as major catastrophic, catastrophic, extraordinary and ordinary events.
The results show that, in the study region, winter events, among the others, affected the wider regional sectors, while the most numerous cases occurred in autumn season.
Results on the temporal evolution of the DHEs show that the frequency of major catastrophic and catastrophic events has decreased since 1971, and that, in recent decades, Calabria has suffered from damaging effects even though daily rain did not reached extreme values. In fact, the duration of triggering rain, the maximum daily rain of the events and the frequency of the high-return-period-rain showed a decreasing trend throughout the study period.
As to what concerns the damaging phenomena, landslides were identified as the most frequent in every season and in each type of events, and the eastern side of the region was identified as the most frequently and heavily damaged. In autumn cases, landslides caused the majority of damage, besides to relevant percentages of damage caused by flash floods and floods.
Finally, according to literature, a decreasing trend in the number of victims per event was also evaluated.
The proposed analysis can be applied to different study areas in order to assess the relative magnitude of DHEs and their evolution throughout the years. Nevertheless, due to the strict relationship between climatic and geomorphological features of the area, historical data collection must be specifically carried out, to define the typical characteristics of local events and to build a local event chart. The classification criterion adopted in this study can be useful to compare different events for either scientific or insurance purposes, and to characterize the rainfall-damage scenario of a study area.