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Rainfall thresholds for landslide early warning in Sicily: development and comparison

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Identification of the characteristics of rainfall events potentially leading to landslides plays a key role in the implementation of early warning systems, oriented to reduce the victims and the damages caused by these natural hazards. Due to their geomorphological features and also to the lack of adequate mitigation infrastructures, hilly and mountainous parts of Sicily are systematically hit by landslides when intense rainfall events occur. In particular, debris flows are frequent in the Peloritani Mountains, in the north-eastern part of the island, while in many other parts of Sicily slower and deeper landslides and rockfalls are the most frequent types. While occurrence of the former type has caused victims and huge damage, occurrence of the latter types mainly has been responsible of several accidents in roads and railways, and has often made impassable important traffic links in Sicily.

In this study rainfall thresholds for the initiation of landslides are assessed separately for different areas of Sicily which are approximately homogenous with respect to the type of landslide most likely to occur. Several sources of rainfall and landslide information are exploited and various types of empirical models are explored in order to identify the most adequate ones. Uncertainty in the thresholds is evaluated as well, by considering the rainfall events not associated to landslides.

Results obtained for the analysed areas are then compared in order to understand which are the different rainfall conditions that lead to the different types of landslides and the related degree of uncertainty in triggering-threshold assessment.