



National and regional rainfall thresholds for the possible initiation of landslides in Italy

Silvia Peruccacci (1), Maria Teresa Brunetti (1), Mauro Rossi (1), Silvia Luciani (2), Daniela Valigi (2), and Fausto Guzzetti (1)

(1) CNR, IRPI, Perugia, Italy (mariateresa.brunetti@irpi.cnr.it), (2) Dipartimento di Scienze della Terra, Università di Perugia, Italy

Landslides are frequent and widespread geomorphological phenomena in Italy. A nationwide investigation completed by the Italian National Geological Survey has identified approximately 5×10^5 landslides, an average of 1.6 slope failures per square kilometre. Most of the mapped slope failures are known - or considered - to be triggered by intense or prolonged rainfall. Determining the amount of rainfall that, when reached or exceeded, can result in landslides is important to forecast the possible occurrence of landslides in Italy. The Italian national Department for Civil Protection (DPC) is implementing a national landslide warning system based on rainfall thresholds, rainfall measurements, and quantitative rainfall forecasts. We are working with the DPC to define new rainfall thresholds to be implemented in the national system. For the purpose, we have compiled a catalogue of 875 rainfall events that have resulted in documented landslides in Italy since 1841, including 77 rainfall events in the Abruzzo Region (central Italy) in the period 2002-2009, and 145 rainfall events in the Calabria Region (southern Italy) in the period 2001-2009. For each event in the catalogue, we have collected information on: (i) the total amount of rainfall, (ii) the rainfall duration, (iii) the day and (when available) the time or period of the failure, (iv) the geographical location of the landslide, (v) the number of landslides, when more than a single failure was reported, and (vi) climatic information, including the mean annual precipitation (MAP) and the average number of rainy days in a year (RDs). We have experimented with two methods to define objective intensity-duration (ID) national rainfall thresholds for Italy, and regional rainfall the rainfall thresholds for the Abruzzo and the Calabria Regions. The first method exploits Bayesian statistical inference, and the second method adopts a Frequentist probabilistic approach. This is an improvement over existing methods that determine empirical thresholds based on visual interpolation. The new regional thresholds will be implemented in the national warning system to forecast landslides in the Abruzzo and in the Calabria Regions. For the remaining Italian regions, the system will use the new national thresholds until regional thresholds will become available.