



Derivation of critical rainfall thresholds for landslide in Sicily

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Rainfall is the primary trigger of shallow landslides that can cause fatalities, damage to properties and economic losses in many areas of the world. For this reason, determining the rainfall amount/intensity responsible for landslide occurrence is important, and may contribute to mitigate the related risk and save lives. Efforts have been made in different countries to investigate triggering conditions in order to define landslide-triggering rainfall thresholds. The rainfall thresholds are generally described by a functional relationship of power in terms of cumulated or intensity event rainfall-duration, whose parameters are estimated empirically from the analysis of historical rainfall events that triggered landslides.

The aim of this paper is the derivation of critical rainfall thresholds for landslide occurrence in Sicily, southern Italy, by focusing particularly on the role of the antecedent wet conditions. The creation of the appropriate landslide-rainfall database likely represents one of main efforts in this type of analysis. For this work, historical landslide events occurred in Sicily from 1919 to 2001 were selected from the archive of the Sistema Informativo sulle Catastrofi Idrogeologiche, developed under the project Aree Vulnerabili Italiane. The corresponding triggering precipitations were screened from the raingauges network in Sicily, maintained by the Osservatorio delle Acque - Agenzia Regionale per i Rifiuti e le Acque. In particular, a detailed analysis was carried out to identify and reconstruct the hourly rainfall events that caused the selected landslides.

A bootstrapping statistical technique has been used to determine the uncertainties associated with the threshold parameters. The rainfall thresholds at different exceedance probability levels, from 1% to 10%, were defined in terms of cumulated event rainfall, E , and rainfall duration, D . The role of rainfall prior to the damaging events was taken into account by including in the analysis the rainfall fallen 6, 15 and 30 days before each landslide. The antecedent rainfall turned out to be particularly important in triggering landslides. The rainfall thresholds obtained for the Sicily were compared with the regional curves proposed by various authors confirming a good agreement with these.