Comparison between intensity- duration thresholds and cumulative rainfall thresholds for the forecasting of landslide

Geophysical Research Abstracts
Vol. 16, EGU2014-15048, 2014
EGU General Assembly 2014

Comparison between intensity- duration thresholds and cumulative rainfall thresholds for the forecasting of landslide

Daniela Lagomarsino, Ascanio Rosi, Guglielmo Rossi, Samuele Segoni, and Filippo Catani
University of Firenze, Department of Earth Sciences, Firenze, Italy (daniela.lagomarsino@unifi.it)

This work makes a quantitative comparison between the results of landslide forecasting obtained using two different rainfall threshold models, one using intensity-duration thresholds and the other based on cumulative rainfall thresholds in an area of northern Tuscany of 116 km2.
The first methodology identifies rainfall intensity-duration thresholds by means a software called MaCumBA (Massive CUMulative Brisk Analyzer) that analyzes rain-gauge records, extracts the intensities (I) and durations (D) of the rainstorms associated with the initiation of landslides, plots these values on a diagram, and identifies thresholds that define the lower bounds of the I–D values. A back analysis using data from past events can be used to identify the threshold conditions associated with the least amount of false alarms.
The second method (SIGMA) is based on the hypothesis that anomalous or extreme values of rainfall are responsible for landslide triggering: the statistical distribution of the rainfall series is analyzed, and multiples of the standard deviation (σ) are used as thresholds to discriminate between ordinary and extraordinary rainfall events. The name of the model, SIGMA, reflects the central role of the standard deviations in the proposed methodology.
The definition of intensity–duration rainfall thresholds requires the combined use of rainfall measurements and an inventory of dated landslides, whereas SIGMA model can be implemented using only rainfall data.
These two methodologies were applied in an area of 116 km2 where a database of 1200 landslides was available for the period 2000-2012. The results obtained are compared and discussed.
Although several examples of visual comparisons between different intensity-duration rainfall thresholds are reported in the international literature, a quantitative comparison between thresholds obtained in the same area using different techniques and approaches is a relatively undebated research topic.