Geophysical Research Abstracts,
Vol. 11, EGU2009-12763-2, 2009
EGU General Assembly 2009
© Author(s) 2009

Critical rainfall thresholds for debris-flows occurrence and climate changes in the Dolomitic area of Cortina d'Ampezzo (North-Eastern Italian Alps)

M. Floris (1), A. D'Alpaos (1), P.R. Tecca (2), C. Squarzoni (1), R. Genevois (1), and M. Marani (3)
(1) Department of Geosciences, University of Padova, Italy, (2) CNR-IRPI, Padova, Italy, (3) Department of Hydraulic, Maritime, Environmental and Geotechnic Engineering, University of Padova, Italy

The mountainous area of Cortina d'Ampezzo (Dolomites, Eastern Italian Alps) is prone to debris-flow release in response to summer high intensity-short duration rainfalls. As this area has a great touristic economic value to maintain and is densely populated, it is of the utmost importance to prevent possible property damage and casualties associated to debris flows. According to previous research for predicting debris-flow occurrence, critical rainfall threshold is a crucial triggering factor. Many studies have been carried out to establish such thresholds, based on different approaches. In this note we analyze rainfall data recorded during the period 2000-2005 in the debris-flow monitoring system of Acquabona (Cortina d'Ampezzo) (Tecca et al., 2003), to evaluate the critical rainfall threshold in the study area, expressed in terms of cumulated rainfall and rainfall intensity. Preliminary results show that the triggering threshold seems to be unaffected by long-term antecedent precipitation. All the flows were triggered by rainfalls of less than 1 hour duration, with peak rainfall intensities ranging from 4.8 to 14.7 mm / 10 min. Furthermore it has been observed that the initial debris surges were associated with peak rainfall intensities measured over 10 minutes.
Seventy rainfall events, triggering and not-triggering debris flow, have been analyzed in terms of cumulated rainfall, duration, average intensity, maximum hourly intensity, maximum intensity over 10 minutes. Based on the results, using the aforementioned terms, we found that debris-flow triggering rainfalls are clearly discriminated from the not-triggering rainfall when considering the maximum intensity rainfall over 10 minutes.
In a peak over threshold framework applied to the rainfall data measured at the Faloria rain gauge station from 1990 to 2006, the probability of occurrence of the determined rainfall threshold for different time intervals has been computed. The exceedance of the precipitation threshold is a necessary but not sufficient condition for debris-flow triggering, and therefore the probability of debris-flow occurrence has been evaluated as a function of the determined rainfall threshold and the number of the associated debris flows (Floris & Bozzano, 2008).
After comparison of the high intensity and short duration rainfall data collected from 1921 and 1994 at several rain gauge stations in the study area with the Faloria station rainfall series, the results showed great differences indicating an increment of exceptional rainfall events, probably related to the global climate changes. These findings suggest that the exceedance of rainfall thresholds could be underestimated by the forecasting models based on extreme value statistic.
These results have been proved useful to preliminary studies and to establish warning systems based on smart rainfall stations.

References

Floris M. & Bozzano F. (2008). Evaluation of landslide reactivation: A modified rainfall threshold model based on historical records of rainfall and landslides. Geomorphology, 94, 40–57.

Tecca P.R., Galgaro A., Genevois R. & Deganutti A.M. (2003). Development of a remotely controlled debris flow monitoring system in the Dolomites (Acquabona, Italy). Hydrological Processes, 17, 1771–1784.