Estimation of debris-flow magnitude in the Eastern Italian Alps

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Abstract
The estimation of debris-flow magnitude is an essential step in the assessment of debris-flow hazard. Although different methods have been developed for the assessment of debris-flow magnitude, this is still a difficult task because of the complexity of flow processes and the lack of data to test estimation procedures in many mountainous regions. Data on debris-flow magnitude from 127 basins in the Eastern Italian Alps have been collected from scientific and technical journals, technical reports, historical documents gathered from local archives, and field surveys. These data were used to develop and test different predictive approaches, encompassing regression equations, geomorphological surveys and probabilistic analysis of time series. Regression techniques were used to correlate debris-flow magnitude to morphometric parameters and geological characteristics of the basins. Values of the channel debris yield rate (contribution per unit length of channel), proposed in the literature, were compared with data from the study area for identifying reference values for channel stretches of different morphological characteristics. Although limited to the few basins in which sufficient data were available, the probabilistic analysis of time series of debris-flow magnitude provides indications about the relations between magnitude and frequency of debris flows. Some observations about the capability and drawbacks of considered methods are presented and the combined use of different approaches for the estimation of debris-flow magnitude is suggested.

Keywords: debris flow; magnitude; frequency; Alps.

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