



Remote sensing precipitation data to determine rainfall thresholds for the possible occurrence of landslides in central Italy

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We defined rainfall thresholds for possible landslide occurrence in central Italy using remote sensing precipitation data. For the purpose, we used 3-hour cumulated rainfall on a $0.25^\circ \times 0.25^\circ$ grid provided by NASA. We compared the thresholds with thresholds defined for the same area using rainfall measurements obtained from a network of 154 rain gauges in central Italy. For each rainfall event that has resulted in one or more landslides in the period 2002-2010, we calculated the cumulated rainfall E (mm) and the duration D (h) of the rainfall event. We compiled two data sets of empirical rainfall conditions (D , E) obtained from the rain gauge measurements and the remote sensing precipitation data. Using this information, we defined two different ED thresholds, for rain gauge measurements and for the remote sensing estimates. To define the thresholds, we adopted a Frequentist probabilistic method that assumes that the threshold curve is a power law $E = \alpha \cdot D^\gamma$, where E is the cumulated rainfall (mm), D is the duration of the rainfall event (h), α is a scaling constant (the intercept), and γ is the slope of the power law curve. We defined rainfall thresholds corresponding to an exceedance probability of 5% for the remote sensing data T_{5S} , and for the rain gauge measurements T_{5R} . Inspection of the two thresholds shows that the threshold curves have a similar scaling exponent γ , with T_{5S} exhibiting a lower intercept α . We conclude that, in the study area, the cumulated rainfall required to initiate landslides estimated using the remote sensing precipitation data is persistently lower than the cumulated rainfall measured by the rain gauges. The result is significant. The two thresholds have a similar slope and this suggests that remote sensing precipitation data can be used to obtain rainfall thresholds for the possible occurrence of landslides. This can be useful in areas where rain gauge measurements are insufficient, or inexistent.