



Correlations between historical landslides and rainfall from 1951 to 2002 in the Emilia-Romagna region of northern Italy

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We investigate correlations between rainfall and historical landslides in the 51-year period, 1951-2002, in the Emilia-Romagna Region, Northern Italy. We use daily precipitation measurements for selected rain gauges, and we exploit a catalogue of 2253 historical landslides for the Reggio Emilia, Modena and Bologna provinces, in the Emilia-Romagna Region. The historical catalogue was compiled through a thorough and systematic search of existing catalogues of historical landslide events, supplemented by an extensive search of local historical archives and chronicles. Care was taken in reporting the date or the period and the location of the reported landslides, and that no duplicates were listed. The 2253 individual landslides reported in the catalogue were further grouped into 596 different landslide events (Sevent), consisting of 1 to 129 landslides each. Grouping was performed by considering the successive landslides over time; during the winter (summer) a period of four (two) days without landslides was considered a separate event. We examine the correlation between the cumulated rainfall amount for different rainfall periods, from 1 to 30 days, and: (i) the number of triggered landslides, and (ii) Sevent. We find that for short antecedent rainfall periods the minimum amount of rainfall necessary to trigger landslides varies considerably with Sevent (the magnitude of the event), and that for long antecedent period Sevent is largely independent of the cumulative amount of rainfall. However, the largest landslide events are always preceded by abundant rainfall. We then compare measures of precipitation with the occurrence (or lack of occurrence) of landslide

events. We experiment with trend corrected and weighted trend corrected measures of precipitation, and we find that no clear relationship exists between the trend of precipitation and the occurrence and magnitude of landslide events (Sevent). We take this as indication that climate and its decadal variation are not significant for the initiation of large landslide events in the three studied provinces in the Emilia-Romagna Region of northern Italy. We find a slightly improved correlation for the medium-term trend of precipitation. We consider this an indication that seasonal variations in rainfall are significant for the initiation of medium to large landslide events.