Catalogues of historical landslides and frequency of landslide events in italy

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To obtain quantitative estimates of landslide hazards, information on the frequency of the expected landslide events is mandatory. This information is difficult to obtain from conventional geomorphological investigations, through field work or from the analysis of aerial photographs or remote sensing images. Archive landslide inventories provide a valuable alternative. Archive inventories are a form of landslide database compiled from data captured from the literature; through inquire to public organisations and private consultants; or by searching chronicles, journals, technical and scientific reports, and by interviewing landslide experts. From archive inventories one can obtain catalogues of historical landslide events, which list the date (often incomplete) and, where known, the exact or approximate location of individual or multiple landslides. We obtained 7 catalogues of historical landslide events in northern and central Italy. The catalogues have different characteristics, namely: (i) they cover different periods, from 1300 to 2003; (i) they span different lengths of time, from 87 to 700 years; (iii) they cover areas of different extent, from 400 to 8456 square kilometres; and (iv) they have various degree of completeness. We use the 7 catalogues to estimate the rate of occurrence of landslide events in the areas for which the historical information is available, and to compare the obtained rates. To estimate the rate of landslide events we prepare cumulative curves showing the total number of historical events in time. We consider the problem of completeness of the catalogues, and we argue that for reasonably complete catalogues the slope of the cumulative curves may represent a proxy for the average rate of the events. We further argue that distinct changes in the slope of the cumulative curves may indicate variation in the average rate of the events. We normalize for time, number of events and area, and we compare the rates obtained for the different regions with climatic and meteorological indicators that were available to

us (e.g., mean annual rainfall and temperature, daily rainfall and temperature). We further show how the obtained average rates of landside events can be used to estimate the probability of future landslide events in a region, and we discuss limitations of the proposed approach for landslide hazard assessment, including zonation and civil defence warning systems.