



An attempt to estimate landslides and floods risk to the population in Italy at the regional scale

P. Salvati, C. Bianchi, F. Guzzetti, and M. Rossi
CNR-IRPI, Perugia, Italy (paola.salvati@irpi.cnr.it, +39 075.5014420)

Risk analysis aims to determine the probability that a hazard will cause harm, and it investigates the relationships between the frequency of damaging events and the intensity of the consequences. The number of casualties (deaths, missing persons, and injured people) caused by landslides and floods is a measure of the intensity of a disaster, and can be used to evaluate the geo-hydrological risk to people. Societal risk is commonly established using frequency-consequence plots, where the number of casualties caused by a single event is plotted against the frequency of the event. The catalogue of historical flood and landslide events that have caused loss of life, missing persons, injuries and homelessness in Italy was recently updated for the 1149-year period from AD 860 to 2008. This information was used to evaluate landslide and flood risk to the population of Italy, at the national and the regional scale. For our assessment, we used the section of the historical catalogue from 1850 to 2008. The relationship between the probability of harmful events and the magnitude of the events, measured by the number of casualties, was investigated for the entire Italian territory and for the twenty individual Italian regions. To model the probability of events with casualties we adopted a Zipf distribution, which prescribes a power-law probability for the size of a random event that takes an integer value of at least one. The Probability Mass Function (PMF) of landslide and flood events with casualties was computed for Italy and for three regions for which data in the catalogue were sufficient to estimate the probability distribution for the period between 1850 and 2008, and for three time intervals: 1850-1900, 1901-1950, and 1951-2008. Analysis of the Zipf distributions show a decrease in the Probability Mass Function (PMF) from the first to the last period, and particularly for the period 1951- 2008. We correlate the decrease in the PMF to the increase in the catalogue completeness, chiefly for very low magnitude events (one-two casualties events). For low and very-low magnitude events we consider substantially complete the section of catalogue after 1950, and useful to evaluate landslide and flood risk at the regional scale. For the same period, demographic information is available for the 8102 Italian municipalities. Using this information, the density of the casualties was compared to the population grow rate and to the population density.