



## **Relationships between precipitations and shallow landslides in the Municipality of Genoa (Italy)**

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During the last century the area of the Municipality of Genoa has been affected by recurrent floods that provided many damages both to the urbanized areas of the coastal plane and to the slopes behind it. These events are prevalently caused by local climatic factors. In fact the peculiar morphologic features of this area, characterized by slopes very close to the coast, causes a slowing of the humid southern winds and so favours the occurrence of heavy rainfall. Other causes are linked again to natural factors, such as the small extent of the hydrographic basins and the presence of steep slopes, but they are especially linked to anthropogenic factors such as intensive urbanization and changes in the land-use management with the abandonment of the traditional agricultural practices. The importance of the damages caused by floods on this area is often increased by the effects of shallow landslides (prevalently debris flow and soil slip) affecting the slopes triggered by the rainfall. The occurrence of these landslides contributes to the solid flow of the streams and increase the floods energy. Besides they can cause temporary barrages along the river-beds making possible the accumulation of thousands of cube meters of water that can be released suddenly generating anomalous waves. These phenomena are very dangerous because they can cause unpredictable flow peaks: it's clear that in these cases, that occurs very frequently, it is impossible to predict and to control the basins behaviour. The shallow landslides on the Genoese territory, with regard to their frequency and extent, seem to show a direct proportional link both with the area's geomorphological complexity and the rainfall regime. Moreover during the last years a tendency to a concentration of the rainfall in a shorter number of days respect to the past (even if they maintain about the same

quantity) it has been observed. In this work the results of a detailed study concerning the characteristics of the triggering rainfall in the territory of the Municipality of Genoa are shown. It includes four steps: a) statistical analysis of the maximum intensity rainfall data (1, 3, 6, 12, 24 hours), recorded by different pluviometric stations, to obtain informations about the maximum intensity rainfall “return time”; b) the census of the shallow landslides triggered by rainfalls during the period between the 1991 and the 2002; c) the detailed reconstruction of the evolution (1, 3, 6, 12, 24 hours) of the triggering rainfall; d) the comparison between the characteristics of the triggering rainfall and their “return time”. Finally, in order to determine the pluviometric thresholds of shallow landslides in function of the characteristics of the precipitations, an hydrological model has been applied to the Bisagno river’s basin, the most important of the studied area. This model, recently applied by other authors to alpine and pre-alpine areas, has been modified in this work to obtain more realistic results for the Liguria region by considering the specific characteristics of the local precipitations, which last mostly less than 24 hours.