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The 1910 landslides in Cetara basin

I. Rischia (1), A. Trigila (1), F. Fumanti (1), R. Rosso (2), M.C. Rulli (2), L. Serva (1), G. Tranfaglia (1) and C. Violante (3)

(1) APAT, Roma, Italy (2) Politecnico, Milano, Italy, (3) IAMC – CNR, Napoli, Italy

This work is concerned with the statistical analysis and numerical modelling of debris flow and mud flow events triggered by high rainfall. As a case study, we present the results from a 3.8 km^2 basin, located within the mesozoic carbonates of the Campano - Lucana platform later on covered by the volcanoclastic deposits of Vesuvius eruption 79 A.D.

The study has been carried out considering: i) historical research of the previous events; ii) geomorphological, structural, hydrogeological, geotechnical and land use features of the investigated area; iii) analysis of hydrological and rainfall data; iv) numerical modeling leading to slopes instabilities within the pyroclastic cover.

First of all, the reconstruction of the 23-24 October 1910 event, with reference to meteorological conditions, source areas and mass transport along slopes and hydrological network was operated from archives information supported by aerial photography analysis. Among the factors controlling the slopes instability, the soil constituents and the geomineralogical properties of the pyroclastic cover able to explain the strong variability of hydrologic conductivity among the different pyroclastic and soil horizons and their marked lateral and vertical anisotropy have been also analysed. Finally, among the structural and geomorphologic peculiarities, it have been considered the regional tectonic lineament controlling the water circulation within the acquifers, the structural ledges within the carbonatic substratum and the high slopes gradients (from 35˚ to over 60˚).

The landslide hazard of the Cetara basin concerning possible debris flow events has been secondly assessed on stochastic grounds. For this purpose the hydrological characterization and the meteorological hazard assessment of the basin have been defined. The first of the two aspects has been analysed by applying the LSPP method which

has given the variability of the hazardous thickness and average rain rate as function of the repose time. Then the rainfall water absorption characteristics of pyroclastic soils have been evaluated through the Curve Number (CN) method.

Finally on the grounds of the LSPP and CN data, the value of the peak discharge has been obtained. The results have been ultimately tested via numerical models showing the debris flow susceptibility, controlled at the above described boundary conditions.