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Distribution of ash-fall deposits on Campanian carbonate slopes and implications on debris slides - debris flows initiation

P. De Vita (1), R. Panza (1) and M. Siniscalchi (1)
(1) Department of Geophysics and Volcanology - University of Naples

The debris slides - debris flows represent both one of the most significant denudational processes in the pyroclastic soil-mantled carbonate massifs that surround the Campanian Plain, and the main risk source for the towns located at the foot of their slopes, as is well known. The ash-fall deposits, mainly derived from the explosive activity of Mount Somma-Vesuvius, were varyingly distributed among the carbonate mountain ranges that surround the Plain, according to the dispersion axes of each eruption, reaching total thickness values ranging from 2 to 7 metres. After deposition, the pyroclastic deposits underwent erosion processes, mostly by means of mass movements, generally regulated by slope angle and by heavy rainfall occurrence, which accounts for the volcanoclastic series along the slopes often being incomplete. In this work, a field survey based on test pits and laboratory tests has been carried out on debris slides - debris flows source areas of the Sarno Mountains. One of the principal results put in evidence was a relationship between slope angle ranges and the stratigraphic schemes of ash-fall, which only shows more complete stratigraphic records in slope angles up to generally 25°, and incomplete stratigraphic records for the higher slope angle ranges. The complex stratigraphy consisting of ash-fall deposits alternated with the pedogenetic products developed during the intervals between consecutive eruptions, results in a multilayered and very contrasting permeability surficial hydrogeological system. This physical feature, along with the varying distribution of pyroclastic series onto the slopes of the source areas, caused by the diverse morphologic conditions, leads to an engineering geological model in which hydraulic conductivity horizons consisting of pumice lapilli, confined by less permeable deposits, undergo a reduction in thickness as slope angle increases, until they assume a lenticular shape. This model presents an improvement on the previously hypothesized, controversial slope

stability models, giving a better comprehension of landslide susceptibility assessment due to occasional saturated throughflows within the pyroclastic cover, whose instability effects are amplified in those areas where hydrographic convergence and thickness reduction of lapilli strata, as well as artificial interruption of the soil mantle, coexist.