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Spatial analysis of hydraulic conductivity for slope deposits at catchment scale in Northern Tuscany, Italy

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Hydraulic conductivity (K) is a relevant engineering geology property of slope deposits (SD) overlying the geological bedrock. This parameter is relevant at the field scale to simulate infiltration and runoff processes, hillslope stability numerical analysis, hydrological studies and environmental issues.

Direct measurements (field and laboratory tests), as well as indirect estimations ($e.g.$ correlations from grain size distribution, pedotransfer functions) are available in the literature for estimating K. Many measurements are required to obtain significant results since K depends on many factors such as grain size distribution, bulk density, organic matter, etc.

A big set (about 750) of K field measurements in the vadose zone of SD in Northern Tuscany (Italy) has been performed by means of constant and/or falling head permeameter. For each test site (a total of 150 locations), other engineering geology properties of SD such as depth, texture, bulk density, Atterberg limits and grain size distribution have been determined.

In this work the local variability of K has been estimated thanks to a statistical analysis of K for each test site. Moreover geostatistical techniques have been applied to infer the spatial correlation of K at the catchment scale.

The results show that K varies across the SD profile and in the geographic neighborhood of the test site exhibiting high spatial variability within the study area. The new pedotransfer function, that has been developed with satisfactory results (the determination coefficient R^2 = 0.84), suggests that the *depth* of SD and d_{20} (is the diameter corresponding to 20% finer in the particle-size distribution) play a relevant role in the prediction of K.These parameters can be considered with profit in spatial analysis of K for SD allowing to produce K maps in the study area.