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Abstract

Impact of Landscape Attributes on Surface Water in the Tiber River Basin (Central Italy) †

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Abstract: River catchments are highly complex systems characterized by several properties such as self-organization, multi-scale variability, hydraulic and topographic gradients, patchiness and heterogeneity, resilience and a hierarchical structure. These features, coupled with several geomorphological, anthropogenic and climatic drivers, are expected to influence the surface water composition over different temporal and spatial scales. The knowledge of these complex interlinks plays a key role in both river basin management and predictability to potential pollution events. Nevertheless, due to the considerable amount of factors involved in the analysis, the unique combination of attributes characterizing each catchment and the lack of data at an adequate scale, it still remains unclear which of the environmental parameters have a major influence on the water chemistry. In this work, the hierarchy of the variability in the chemical composition of 160 water samples collected in 2017 throughout the Tiber River Basin, the largest catchment in Central Italy (17,156 km^2), was explored. The results obtained by using advanced statistical methods, including the Compositional Data Analysis, highlighted different sources of variability linked to the geological (low variability) and anthropogenic origin (high variability) of the main solutes. Furthermore, for each sampling site, the corresponding watershed was calculated from the Digital Terrain Model using a Geographical Information System-based elaboration. The aim was to evaluate the relationships between the landscape morphological properties of the watersheds, such as elevation, drainage area, slope or other morphometric indexes and the physical-chemical parameters of the river waters on the basis of different geological and topographical settings of the basin. The outcomes proved to be particularly useful to discriminate between water chemistry mainly influenced by surface run-off processes and that affected by ground water circulation.

Keywords: geocomputation; river chemistry; landscape properties