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Spatial data and GIS for regional geodiversity assessment

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Spatial analysis and quantitative measurement of environmental variables are at the base of an innovative approach for investigating the mutual relationship between the different components of an ecosystem. Abiotic and biotic elements are strictly correlated but methods and techniques employed for their assessment are not always comparable. Geodiversity is a crucial topic, defining and measuring the degree of variability of the abiotic component, at the base of the biodiversity. Thus, the concept of geodiversity and its definition in a quantitative perspective are fundamental for the development of research in this field of the Earth Sciences.
The use of digital data in a GIS environment is the preferred solution in order to have a quantitative approach useful for relating different terrain information. The raster format and the map algebra operators and tools allow overlying a wide number of data, in particular remote sensed data as Digital Terrain Models. Therefore GIS enclose data, procedures and scientific methods in order to obtain a common platform for geodiversity assessment. This paper shows a quantitative method for the definition of a Geodiversity Index.
The study area corresponds to the Umbria region (central Italy), an area rich of geodiversity for both geological and geomorphological aspects.
The input variables are geological and morphometric parameters. In particular drainage density and topographic attributes are overlapped; they are at the base of the formula to estimate the geodiversity variability. The result is a digital dataset sharing the study area in a raster matrix with different degree of geodiversity.
The main goal of this analysis is to verify the possibility of excluding the geomorphological maps and the individual landforms from the training set, using the geomorphological parameters capable of representing the geomorphological characteristics of the study area as test set. The results are validated in two test areas: the first is a natural park with a wide spectrum of values for the geodiversity; the second one corresponds to an alluvial plain where the flat areas heavily influence the results. In both cases the validation provides reliable results, confirming the fitness of the working approach for a correct assessment of geodiversity index. Moreover, the proposed method provides a useful and validated procedure to quantify geodiversity when a geomorphological map is not available as input data.