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GIS and Multi-criteria evaluation (MCE) for landform geodiversity assessment

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In geomorphology, at the contemporary stage of methodology and methodological development, it is very significant to undertake new research problems, from theoretical and application point of view. As an example of applying geoconservation results in landscape studies and environmental conservation one can refer to the problem of the landform geodiversity. The concept of geodiversity was created relatively recently and, therefore, little progress has been made in its objective assessment and mapping. In order to ensure clarity and coherency, it is recommended that the evaluation process to be rigorous. Multi-criteria evaluation meets these criteria well.
The main objective of this presentation is to demonstrate a new methodology for the assessment of the selected natural environment components in response to the definition of geodiversity, as well as visualization of the landforms geodiversity, using the opportunities offered by the geoinformation environment. The study area consists of two peculiar alpine valleys: Illgraben and Derborence, located in the Swiss Alps. Apart from glacial and fluvial landforms, the morphology of these two sites is largely due to the extreme phenomena(rockslides, torrential processes). Both valleys are recognized as geosites of national importance.
The basis of the assessment is the selection of the geographical environment features. Firstly, six factor maps were prepared for each area: the landform energy, the landform fragmentation, the contemporary landform preservation, geological settings and hydrographic elements (lakes and streams). Input maps were then standardized and resulted from map algebra operations carried out by multi-criteria evaluation (MCE) with GIS-based Weighted Sum technique. Weights for particular classes were calculated using pair-comparison matrixes method. The final stage of deriving landform geodiversity maps was the reclassification procedure with the use of natural breaks method.
The final maps of landform geodiversity were generated with the use of the same methodological algorithm and multiplication of each factor map by its given weight with consistency ratio = 0.07. However, the results that were obtained were radically different. The map of geodiversity for Derborence is characterized by much more significant fragmentation. Areas of low geodiveristy constitute a greater contribution. In the Illgraben site, there is a significant contribution of high and very high geodiversity classes. The obtained maps were reviewed during the field exploration with positive results, which gives a basis to conclude that the methodology used is correct and can be applied for other similar areas. Therefore, it is very important to develop an objective methodology that can be implemented for areas at the local and regional scale, but also giving satisfactory results for areas with a landscape different from the alpine one. The maps of landform geodiversity may be used for environment conservation management, preservation of specific features within the geosite perimeter, spatial planning or tourism management.