Geophysical Research Abstracts
Vol. 15, EGU2013-838-1, 2013
EGU General Assembly 2013

Geodiversity assessment for environmental management of geomorphosites: Derborence and Illgraben, Swiss Alps

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The concept of geodiversity was created relatively recently and has been accepted by geomorphologists and geologists worldwide. Nevertheless, despite the widespread use of the term, little progress has been made in its evaluation. Until now, only a few authors have undertaken, directly or indirectly, methodological issues related to the geodiversity estimation. In some studies, geodiversity maps were applied to investigate the spatial or genetic relationships with the richness of particular environmental elements like geosites, geomorphosites, geoarchaeological and palaeontological sites, etc. However, so far, the spatial differentiation of geodiversity values in areas already accepted as large geomorphosites has not been undertaken.

This poster presents a new methodology developed to assess the geodiversity in geoinformation environments and tested in two geomorphosites located in the Swiss Alps: Derborence and Illgraben. Derborence is a quite isolated valley, where some big rockslides occurred in the past; the sharp rockslide landforms, high limestone cliffs and a lake dammed by the rockslide deposits attract tourists in summer. A part of the valley is a natural reserve managed by Pronatura (a national environmental association). Illgraben is a steep torrential system on the left bank of the Rhone River valley, characterized by high erosion rates and frequent occurrence of rockfalls and debris flows. The site is the largest active torrential system in Switzerland and is part of a Regional Nature Park. Both geomorphosites are recognized as geosites of national importance.

The basis of the assessment is the selection of features of the geographical environment, which on one hand describe landforms, and on the other indicate geomorphometric differences. Firstly, seven factor maps were processed for each area: landform energy derived from a 25-meter digital elevation model, landform fragmentation generated from the Topographic Position Index (TPI), contemporary landform preservation derived from land use classification using high resolution ortho images, geological settings, geomorphological features, soils and hydrology elements. Input maps were then standardized by attributing grid geodiversity values in five classes to each raster map: very low geodiversity, low geodiversity, medium geodiversity, high geodiversity and very high geodiversity. Obtained maps result from map algebra operations carried out by multi criteria evaluation (MCE) with GIS-based Weighted Linear Combination (WLC) technique. The final geodiversity maps for each of the two geomorphosites were then compared with existing tourist trails and panoramic points to verify if there are any dependencies.

Geosite inventories are a more or less qualitative selection of sites considered as important by the scientific community for their contribution to Earth history knowledge and more in general for the society. Some geosites, in particular geomorphosites, can be quite large (several sq. km), and sometimes heterogeneous. The proposed methodology, tested on two Swiss geomorphosites, allows the intrinsic geodiversity differentiation of large geosites to be assessed and the results could be used for other purposes such as the preservation of specific features within the geosite perimeter, spatial planning or tourist management.