



A new geodiversity index to support biodiversity research in alpine areas

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Geodiversity mapping has become an established tool for assessing the value of abiotic landscapes. It is also recognized that high geodiversity may result in higher variety of potential habitats in a landscape for plants and animals, thus promoting high biodiversity. Widely accepted biodiversity indices exist, e.g. the Shannon index and the Simpson index. There is a lack, however, of generally applicable geodiversity indices, hampering a statistical assessment of the link between geodiversity and biodiversity.

The geotectonic setting and lithological variations are main contributors to geodiversity in alpine areas. These geological variables are overprinted with geomorphological variation, producing a wide range of landforms, which result mainly from glacial, fluvial and gravitational processes over time.

A geodiversity index has been developed for the State of Vorarlberg in western Austria, based on an existing digital geological map and three Land Surface Parameters (LSPs). The LSPs were calculated from a 5m resolution LiDAR-based digital terrain model (DTM), in order to include altitude, slope angle and solar radiation as parameters. Altitude and slope angle are the most important parameters to characterize geomorphological variations. Solar radiation - i.e. the amount of solar energy received over the period of a year - depicts differences in energy received and is a function of shielding and exposure.

The geodiversity index was calculated for a grid of 1 x 1 km. The number of geological rock formations were counted for each cell. In every grid cell the standard deviations of the mean of all cells of the DTM were calculated for slope, altitude and solar radiation. The standard deviations for all grid cells were, then, divided into five groups. The scores of the four parameters were combined to create a geodiversity index. The resulting geodiversity index map of Vorarlberg clearly reflects hotspots of geodiversity, based on the parameters used.

Vegetation records consisting of different biotopes with associated species were used for the calculation of the biodiversity index. For that, the species probability richness was calculated for each grid cell by summing the total number of unique species in each biotope.

Linear regression statistical analysis was used in the analysis of the two datasets. The preliminary results show a significant positive relation that explains a promising part of the variance in biodiversity index with the geodiversity index.

The geodiversity index is a simple measure for the abiotic variability of environmental factors. It can easily be expanded with variables derived from soil data and other LSPs. In addition, the index can be applied to other areas, at other scales and is thus, a novel predictor for explaining biodiversity.