

EGU21-5176

<https://doi.org/10.5194/egusphere-egu21-5176>

EGU General Assembly 2021

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Quantifying geodiversity with alpha, beta and gamma components

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A variety of ways can be used to measure geodiversity, but no consensus on quantifying it exists to date. Most quantifications have thus far focused on the abiotic diversity of individual sites, which offers only limited views on variation of abiotic nature. It is, therefore, important to examine the between-site geodiversity, i.e., the dissimilarities of geofeatures (elements of geodiversity) between different sites. For instance, it would be interesting to recognize not only the most geodiverse sites of an area, but also the sites that have the most unique compositions of geofeatures. This extended geodiversity information could be further applied in nature conservation or land-use planning. We propose that geodiversity research would benefit from adopting the alpha, beta and gamma concepts of species diversity research to provide a more holistic framework for geodiversity assessments. In particular, the inclusion of distance metrics for measuring beta biodiversity could open new perspectives in evaluating beta geodiversity. The integration of these diversity concepts into geodiversity research would also allow a better joint understanding of biotic and abiotic diversity.