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Finding the proper methodology for geodiversity assessment: a recent approach in Brazil and Portugal

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Quantification of geodiversity is a quite new topic. A first set of assessment methodologies was developed during the last years, although with no fully satisfactory results. This is mainly because the whole concept of geodiversity does not tend to be considered, but also because the results are difficult to apply practically. Several major key-points remain unsolved, including the criteria to be used, the scale-factor to be dealt with, the influence of the size of the area under analysis in the type of criteria and indicators, and the graphic presentation of the results. A methodology for the quantitative assessment of geodiversity was defined and tested at various scales. It was applied to the Xingu River Basin, Amazon, Brazil (about 510,000 km2), Paraná state, Brazil (about 200,000 km2), and Portugal mainland (about 89,000 km2). This method is intended to assess all geodiversity components and to avoid overrating any particular component, such as lithology or relief, a common weakness of other methods. The method is based on the overlay of a grid over different maps at scales that range according to the areas under analysis, with the final Geodiversity Index being the sum of five partial indexes calculated on the grid. The partial indexes represent the main components of geodiversity, namely geology (stratigraphy and lithology), geomorphology, palaeontology and soils. Another partial index covers singular occurrences of geodiversity, such precious stones and metals, energy and industrial minerals, mineral waters and springs. Partial indexes were calculated using GIS software by counting all the occurrences present in the selected maps for each grid square. The Geodiversity Index can take the form of a GIS automatically generated isoline map, allowing an easy interpretation by those without or with little geological background. The map can be used as a tool in land-use planning, particularly in identifying priority areas for conservation, management and use of natural resources.