

A GIS-BASED SPATIAL ANALYSIS OF THE DISTRIBUTION OF CAVES IN BRAZIL

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ABSTRACT: This work analyzes the spatial distribution of the Brazilian caves by using geoprocessing techniques and associating these caves to different thematic maps. The Brazilian Center for Research and Conservation of Caves (CECAV), through the National Register for Speleological Information (CANIE), provides the location of all known caves in Brazil. According to the CECAV database, there were 16,089 known caves in Brazil in 2017. The spatial analysis of these caves was performed by combining their location with other information, such as the Brazilian states, biomes, drainage basins, geologic maps, and potential data for the occurrence of more caves. In some regions, due to the large number of caves, the caves hid one another when represented by points by overlapping and so they could not be viewed on some maps. Therefore, the Kernel Density Estimation (KDE) technique was carried out to visualize regions based on their number of caves, showing the regions where there are more caves as hot spots. These analyzes were performed using the Geographical Information System (GIS) package ArcGIS v.10.3. Combining the location of caves with the Brazilian states, biomes, basin, and geologic maps allowed us to generate important statistical data. For example, the Brazilian states with the largest numbers of caves are Minas Gerais (6,301 caves - 39.16%) and Pará (2,473 caves - 15.37%). On the other hand, there are no known caves in Acre, the only state with no caves. Additionally, caves occur in all the Brazilian biomes and drainage basins, mainly in the Cerrado biome and in the São Francisco basin and are associated mainly with carbonate rocks and Banded Iron Formations (BIFs), but also occur in other lithologies, such as quartzites and sandstones. The cave density map, made using the Kernel Density Estimation (EDK) method, made it easier to visualize regions based on their number of caves, since they hide one another when represented by points. The potential map for the occurrence of caves, made based on the CECAV database, is also very helpful and shows us where else we may find more caves, so we can study and preserve them. This work will also serve as a contribution for a worldwide map of cave regions.

KEYWORDS: CAVES; BRAZILIAN SPELEOLOGY; SPATIAL ANALYSIS.