
Methodological proposal for the quantification of the accessibility to Paleolithic rock art through 3D GIS

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Résumé

The evaluation of accessibility to different sectors in caves with Palaeolithic rock art is crucial to interpret the contexts of prehistoric human activity that took place inside them, especially if focused on the areas that are harder to reach. A methodology capable of comparing those spaces in an objective and precise way will allow to deepen in the knowledge of the exploration and appropriation of the underground environment in the Palaeolithic. Its application to different decorated caves would allow us to infer the profile of the artists and the people related to graphic activities throughout the Upper Palaeolithic.

We proposed a method to process spatial information in a GIS through 3D models, calculate numerical cost values and estimate optimal transit routes or needed times to reach several sectors inside a cave, based on morphological features and movement types. These had been obtained through empirical observations and experimental archaeology. We also highlighted the importance of previous geomorphological studies to determine any geological or anthropic changes that may have occurred in the endokarst since its use in the Upper Palaeolithic. This method was firstly been applied in Atxurra Cave, with satisfactory results, comparing objectively the accessibility to different archaeological sectors.

Starting from the results of the first experimentation, we proceeded to the application of this methodology in the hill of Aitzbitarte. For this, we explored and studied geomorphologically all caves with Paleolithic activities and scanned them three-dimensionally. These fieldworks and subsequent laboratory analyses allowed us to reconstruct as accurately as possible the state of the caves when they were frequented in the different phases of the Upper Palaeolithic (MIS 2-3), especially in the Gravettian and the Magdalenian, when they were decorated. These 3D virtual replicas of the state of the caves in the final Pleistocene, and the archaeological data of the graphic ensembles were used to assess the accessibility to the decorated sectors.

The results of Aitzbitarte have been added to those obtained in Atxurra, validating the efficacy of our proposal to enable the objective and quantitative assessment of accessibility to the deep sectors of prehistoric caves. Continuing these analyses in other sites would allow to establish recurring or specific patterns among the human groups that created the Ice Age art.

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Mots-Clés: Cave geomorphology, Cave art, Archaeological context, GIS, 3D cave survey, Caving travel rate