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ABSTRACT BOOK

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GEOSCIENCES FOR
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Environmental characterization of karst caves: evaluation and monitoring for a correct show caves management

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The aim of this work is to identify the main environmental parameters characterizing karst cave to be considered for a proper show cave management.

Generally, caves are described considering their “energy level” (Heaton, 1986). The cave vulnerability is high if the energy level is low. However, the distinction between high, medium and low energy levels is extremely subjective and it is not so relevant for the show cave management. The environmental parameters that should be taken into account before and during the show cave opening are: hydrogeology, air temperature and circulation, CO₂ and radon concentration, biological components and lint presence and abundance.

Water circulation is an extremely important parameter, being the karst processes directly linked to water inputs from percolation (oversaturated or undersaturated water, absence of inputs related to surface anthropization or climate change, with serious repercussions on the speleothems growth) and/or to the presence of water courses or karst aquifers (water level changes, CO₂ and radon inputs). Air temperature and circulation are equally important parameters to monitor. Cavities with high air circulation values are characterized by low air CO₂ (of anthropogenic or natural origin) and radon concentrations, however, these strong air circulations can carry powders inside the caves, damaging the speleothems. The air temperature rising related to the lighting system and the tourist presence can affect the formation of different speleothems or calcium carbonate crystallizations (e.g., calcite, aragonite, vaterite). High air CO₂ concentration of natural or anthropogenic origin can affect the speleothem corrosion phenomena, as well as different biological components such as lampenflora, guano, decomposing organic matter or lint (hairs, microplastics, fine particles, etc.). However, the presence of these components, associated with particular environmental conditions, can also lead to particular minerals and speleothem formation, as well as promoting the presence of different organisms.

All these parameters must be measured over time through appropriate monitoring systems (Balestra et al., 2021). Suitable instruments, high precision probes, duration and frequency of measurements must be carefully considered. Through this kind of surveys, it is possible to follow any change over time and consequently highlight impacts related to human presence. Across the application of a matrix parametric evaluation system, it will be possible to assess the adequacy of the cave to tourist use and propose valuable solutions for conservation purposes.

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