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ABSTRACT BOOK

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Geology for a sustainable management of our Planet



Anthropogenic impact assessment in show caves through environmental parameters monitoring

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As part of the national project PRIN SHOWCAVE, aimed at the study of the anthropogenic impact in show caves, environmental parameters were monitored in three important cavities (Toirano and Borgio Verezzi caves in Liguria, and Bossea cave in Piedmont, Italy). Air-water-rock temperatures and CO₂ air concentrations were detected every 10 minutes, groundwater level variations with hourly intervals.

Air temperature variations are significant not only to assess the tourist passage and light impacts, but also because they allow to understand the air circulation in the cavities. By placing temperature probes outside and at the entrances of the caves it is easy to observe periods with evident variations related to daily thermal fluctuations (intake phase). In the blowing phase, air temperature values remain rather constant over time, flowing air coming from deep areas of the cavity, characterized by a remarkable constant thermal values.

The three examined caves showed different situations. Bossea cave has a unique entrance (one-entrance circulation), and is characterized by several convective cells related to the cave morphology and the air cooling due to the inner collector. Toirano caves are two cavities (Bàsura and S. Lucia Inf. caves) connected through an artificial tunnel. The difference between the high and low entrances is about 20 m with a mild air circulation (multi-entrance cave), highlighted by the different temperature values detected at the two entrances. Borgio Verezzi cave has four entrances with an elevation gain of few meters which guarantees a mild air circulation (multi-entrance cave).

The monitoring of the CO₂ values carried out in the cavities showed a daily impact linked to the tourist passage, with an obvious temporary increases related to the number of visitors. However, the air circulation inside all monitored cavities allows a decrease in CO₂ concentrations. Moreover, collected data highlighted a significant CO₂ air concentration of natural origin in each monitored cave. In Toirano caves, about 8,000 ppm of CO₂ were detected in a not-touristic area, coming from the deep karst networks. In the other two cavities, part of the CO₂ come from the depressurization of the waters circulating in the saturated network of the karst system, near the tourist paths.

Thanks to the data collected in three consecutive years, it was possible to evaluate a rather reduced anthropogenic impact in the three show caves.