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ABSTRACT BOOK

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Geology for a sustainable management of our Planet



Relationship between air-rock-water temperatures in karst caves and surface temperatures

Vigna B.*¹⁻² & Balestra V.*¹⁻²

¹ Dipartimento di Ingegneria dell'Ambiente, del Territorio e delle Infrastrutture, Politecnico di Torino.

² Underground Karst Laboratory of Bossea Cave – S.O. Bossea C.A.I.

Corresponding author email: valentina.balestra@polito.it

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In karst caves air-rock-water temperatures are rather constant over time compared to the surface considerable thermal variations. The significant differences between the outside air temperatures and the in-depth ones, environmental parameters and karst system morphology, trigger the air circulation in the fracture networks. Air has a very low thermal inertia, therefore, if still, it quickly reaches a sort of equilibrium condition with the rock, assuming the rock temperature in absence of significant circulations. The greater thermal exchanges take place near the cave entrances, conditioned mainly by the speed of the incoming air flows. Into depth, temperature of the infiltration waters plays a dominant role in subtracting heat from the limestone masses, which have a lower temperature than the other rocks.

To better understand these processes, the Paleolab of Politecnico di Torino began a series of research through the installation of data loggers for air-rock-water temperatures monitoring in karst caves of southern Piedmont, Italy, characterized by very different environmental conditions. Almemo multiple-channel sensors with temperature probe (accuracy: 0,01; resolution 0,001°C) are used in Bossea cave, TinyTag sensors with temperature probe (accuracy: 0,02; resolution 0,001°C) are used in other caves. In collaboration with Arpa Piemonte, part of the project concerned the monitoring of cavities characterized by the presence of underground glaciers showed a rapid reduction in the last decade, linked to the increase in surface temperatures. In collaboration with S.O. Bossea C.A.I., another part of the project involved the installation of over 50 air-rock-water temperature probes at the “Giovanni Badino” Climatological Research Centre to examine the relationships between surface and in-depth temperature variations. Finally, in collaboration with the Speleo Club Tanaro, the third project concerns the temperatures monitoring of caves characterized by considerable air flows, for examine at different distances from the entrances the relationships between the air and the rock temperatures induced by these air circulations.