

# Environmental parameters monitoring in the oldest show cave of Italy: Bossea Cave

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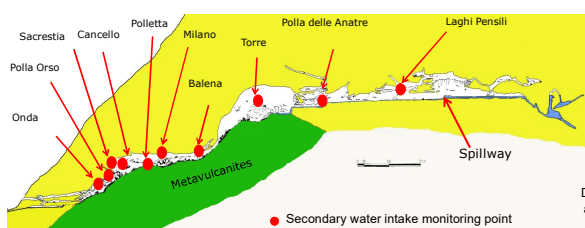
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Three underground karst laboratories are present in Bossea cave for environmental parameters monitoring:

## 1 - Bossea Karst Hydrogeology Lab: water flow, temperature and electrical conductivity monitoring

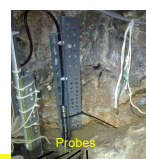
Bossea cave is located in Frabosa Soprana municipality, Piedmont, Italy. It is the first Italian show cave, opened to the public in 1874.



Data logger and server



Cable connection



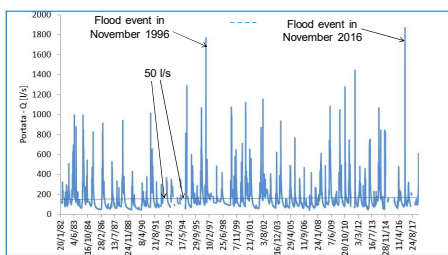
Probes



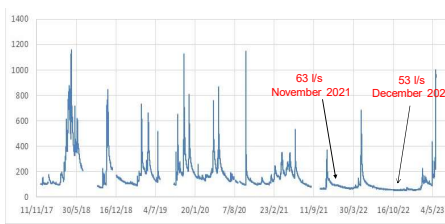
Spillway for underground collector flow rate monitoring

Monitoring system in real time

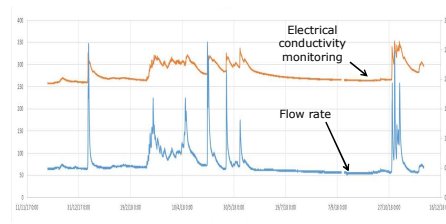
Signal cable



Underground collector flow rate from January 1982 to November 2017



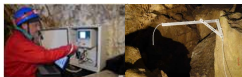
Underground collector flow rate from November 2017 to May 2023



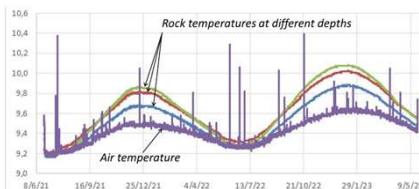
Secondary intake flow rate and electrical conductivity in 2018

## 2 - «Giovanni Badino» Climatological Research Center of Bossea Cave: air-rock-water temperature and CO<sub>2</sub> concentration monitoring

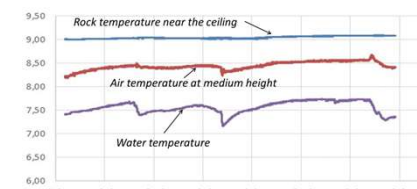
Data loggers are housed in boxes to be protected from air humidity



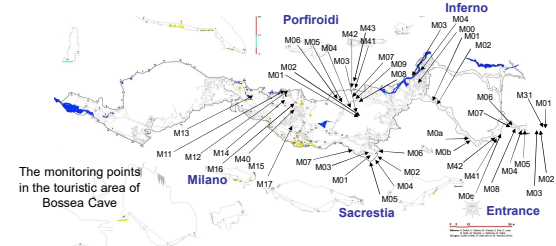
Probe for air temperature monitoring



Sacrestia monitoring point (15 m deep from the surface): trend in rock temperatures (measured in holes of 100, 50, 5 cm depth) and air temperatures from May 2021 to May 2023



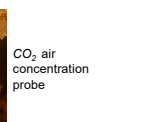
Milano monitoring point: trend of air, rock and underground collector water temperature between June 2021 and May 2023



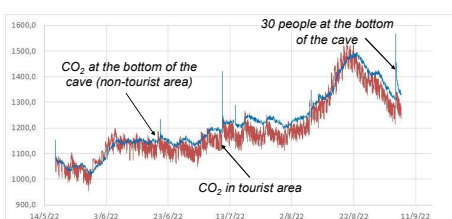
The monitoring points in the touristic area of Bossea Cave



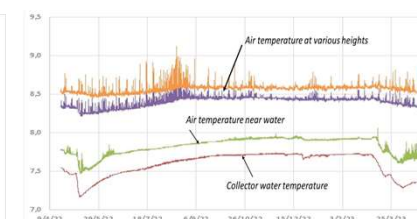
CO<sub>2</sub> air concentration data logger



CO<sub>2</sub> air concentration probe



CO<sub>2</sub> air concentration monitoring in touristic and non-touristic parts of the cave (2022)

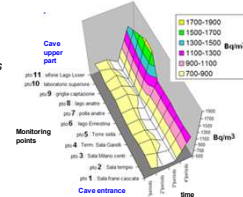
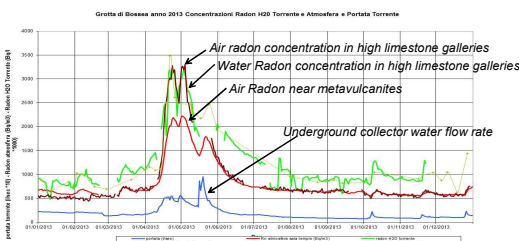


Porfiroidi monitoring point: trend of the collector water and air temperature at different heights, between April 2022 and April 2023.

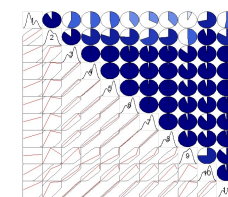
## 3 - Underground Karst Laboratory of Bossea (S.O. Bossea CAI): air-water-rock radon concentration monitoring



Equipment for water radon concentration monitoring



Space-time trend of the radon concentration along the longitudinal section in the Bossea Cave



Correlation between radon concentration trends at different sites (the correlation index  $r=1$  implies the cave is fully colored;  $r=0$  implies a white cake).