Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.18344

Linking microbial metabolic diversity with geochemical characteristics of Campania Region hot springs

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The subsurface is considered one of the largest Earth's biomes1 where the geosphere and biosphere are strictly related to one another. In convergent margins, the continuous cycling of volatile species between the Earth's interior and the surface play a crucial role in controlling the planet's stability and habitability overtime2. Volatile species such as carbon, water, hydrogen, and sulfur are also fundamental in fueling the subsurface microbial communities with redox-active substrates essential for chemolithoautotrophic metabolisms2. Geochemical parameters such as temperature and pH have been identified as the main factors influencing the subsurface microbial communities2. However, not much is known regarding the relationship between subsurface volatile delivery across subduction boundaries and microbial distribution. The particular tectonic setting of Italy, makes it an excellent context to conduct this type of studies. The main geothermal activity in the country originates from the subduction of the African and Adriatic plates beneath the Eurasian plate, giving rise to several volcanic provinces and numerous secondary geothermal emissions. Fluids and volatiles released during subduction interact in Italy with a thick carbonate crust, generating interesting chemistries and providing nutrients from the deep biosphere. While the gas and aqueous geochemistry of Italian host springs has been extensively investigated in the past decades, information related to the microbial diversity and the interactions with the underlying geology is completely missing. Here, we present data from 13 geothermal deeply-sourced seeps spanning the Campania Region, in the south-west of the Italian peninsula. By combining information about the geochemical and biological data we are able to provide a regional-scale overview of the physico-chemical extremes imposed by the tectonic setting on the subsurface biosphere. Our results show a strong effect of the fluid geochemical composition on the microbial community distribution, suggesting a strong coupling between geological and biological processes affecting the volatile composition in the region.

References

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