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Geochemistry, biota and natural background levels in an arsenic naturally contaminated volcanic aquifer

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The tight links between chemical and ecological status are largely acknowledged as for surface water bodies, while aquifers are still considered as hidden groundwater reservoirs, rather than ecosystems to be preserved. Geochemical and biological interactions play a key role in all subterranean processes, including the dynamics of the fate of anthropogenic contaminants. Studies on groundwater dependent ecosystems (GDE) were mainly focused on karst aquifers so far, but an increased awareness on the importance of water-rock interactions and methodological improvements in microbial ecology are rapidly increasing the level of characterization of groundwater ecosystems in various hydrogeological contexts.
Similarly, knowledge about groundwater biodiversity is still limited, especially if porous habitats are concerned. Yet, groundwater and GDEs are populated by a diverse and highly adapted biota, dominated by crustaceans, which provide important ecosystem services and act as biological indicators of chemical and quantitative impact on groundwater resources.
In a previous research (Amalfitano et al. 2014), we reported that the microbial community heterogeneity may reflect the lithological and hydrogeological complexity within volcanic and alluvial facies transition in a groundwater body. The quantitative tracking of the microbial community structure allowed disentangling the natural biogeochemical processes evolving within the aquifer flow path. The analyses of groundwater crustaceans assemblages may contribute to shed more light upon the state and dynamics of such ecosystems.
In the present research, a comprehensive study of a water table aquifer flowing through a quaternary volcanic district is being performed, including the geochemical (inorganic) composition, the microbial composition, and the analysis of crustacean assemblages . Groundwater samples are periodically collected from private wells and springs under a low anthropic impact. The key issues within the sampling area are related to occurrence of arsenic from natural sources, fluoride and coliforms, which make the water resource unsuitable for human consumption. The aim of this work is to present the first outcomes of this activity.

References

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