

Biomineralization processes and heavy metals cycle at Naracauli river, Sardinia

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The Ingurtosu Pb-Zn mine (S-W Sardinia) was in production for about a century until 1968. Huge amounts of tailings were abandoned, resulting in long-term heavy metal dispersion in both stream sediments and waters. Downstream from the mine wastes, the Naracauli waters discharge directly into the Mediterranean Sea. At least two biomineralization processes are known to be effective in the abatement of Zn and other heavy metals transported in solution (De Giudici et al. 2009; Medas et al. 2011)

In this work, many different techniques were used to study the mineralogy and geochemistry controlling the biomineralization processes. Microbial consortia within biofilm associated with seasonal precipitation of an amorphous mineral made of Si, Zn and O were examined. In addition, the load of metal dissolved in the Naracauli waters was measured using hydrologic tracers with synoptic sampling.

The results presented in this work show that a) the consortium of bacteria changes along the river, creating a cascade of processes that results in biologically mediated formation of different Zn-bearing minerals [Medas et al 2011]; b) the changes in water chemistry along the river are moderate for the major constituents, but large changes in trace-element concentrations are observed [Medas et al. 2011]; c) biomineralization processes are effective in decreasing overall Zn load; d) biomineralization processes favour enrichment in heavy Zn isotopes. This is likely due to adsorption of Zn on exopolysaccharides released from cyanobacteria and then nucleation of hydrozincite from these reaction sites.

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References.

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