Behaviour of rare earth elements (REE) at Funil Reservoir, Southeastern Brazil

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Rare earth elements (REE) have specific biogeochemical characteristics, which allow their use as reliable tracers of natural processes at various spatial and temporal scales in aquatic systems [1-3]. This study aims to evaluate the role of Funil Reservoir on REE behaviour. Considering the objectives, water samples were collected in three sample stations, during dry and rainy seasons: (P-01) upstream the Funil reservoir at Queluz, São Paulo State; (P-02) at the reservoir; and (P-03) downstream the Funil Reservoir, at Itatiaia. REE concentrations were determined by ICP-MS.

REE concentrations area presented in Table 1. Calculed ratios from REE normalized by PAAS indicate that values of Gd/Yb > La/Yb, which suggests that there is an enrichment of heavy REE in all sample points in both seasons.

	Rainy season			*Dry season*		
	P-01	**P-02**	**P-03**	**P-01**	**P-02**	**P-03**
ΣREE (ng/L)	72,91	54,14	102,36	77,97	87,71	83,64
La/Yb	0,19333	0,17172	0,05481	0,216	0,212	0,196
Gd/Yb	0,03696	0,3308	0,17023	0,395	0,378	0,395

Table 1: REE concentrations and ratios at study area.

Our results indicate that REE abundance is controlled by weathering in drainage basin. During dry season REE concentrations increased. And during rainy season, REE concentrations before and after the reservoir were greater than concentrations at Funil reservoir (P-02). The distinct behaviour observed between dry and rainy seasons is the Funil Reservoir act as geochemical barrier modifying fluvial transport of REE. Another factor that probably affect REE behavior is algal bloom, with dominance of cyanobacteria which occurs during rainy season, which influence the behaviour of REE through the incorporation and release of these metals.

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Hydromagnesite precipitation in microbial mats from a highly alkaline lake, Central Spain

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Microbialites comprised of up to 45% hydromagnesite and 10% of dolomite have been recognized in Las Eras playa-lake, Central Spain. Las Eras is an evaporitic highly alkaline lake, with pH values ranging from 9.4 to 11, that covers an area of 0.1 km^2 [1]. Mg-enriched groundwater flows into this lake, which is supersatured in hydromagnesite and dolomite. The hydrous Mg-carbonate precipitation occurs in the uppermost layer of benthic microbial mats. This layer is dominated by *Microcoleus* that consists of trichomes in bundles and diatoms embedded in their EPS. Low-vacuum scaning electron microscopy revealed that hydromagnesite nucleation is iniciated on the cells of aerobic heterotrophic bacteria that are responsible for the degradation of the microbial biomass. A progressive mineralization of the heterotroph cells by the deposition of plate-like crystals of hydromagnesite on their surface was observed. This resulting in the entombment of the bacteria and the formation of radiating aggregates of hydromagnesite crystals. The degradation and concomitant Mg-carbonate precipitation, finally, led to the lithification of the microbial mat.

This evolution shows that aerobic heterotrophic bacteria play a crucial role in the formation of microbialites in Lake Las Eras by promoting the Mg-carbonates precipitation. This lake is one of the few modern environments where hydromagnesite is a dominant precipitating mineral in microbialites. Thus, it provides a modern analog to use in the interpretation of saline and/or alkaline environments. In turn, the exceptional preservation of bacteria microfossils clustered into magnesite crystals has been already documented in Miocene saline deposits [2].

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