Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.33142

RARE EARTH ELEMENTS DISTRIBUTION IN PORE WATER OF LAKE SEDIMENTS ALONG A PRODUCTIVITY GRADIENT

SANTIAGO MAREQUE[1,2,3,4], MÉLIANE RENAUD[3,5,6,7], THOMAS BOSSE-DEMERS[1,2,4], AUDREY LABERGE-CARIGNAN[1,2,3,4], HUY DUC DANG[8], FÉLIX CLOUTIER-ARTIWAT[1,2,3,4] AND RAOUL-MARIE COUTURE[1,2,3,4]

[1]Department of Chemistry, Université Laval
[2]Centre for Northern Studies (CEN)
[3]Interuniversity Research Group in Limnology (GRIL)
[4]Takuvik International Research Laboratory
[5]Département de Chimie, Université Laval
[6]Centre d'Études Nordiques (CEN)
[7]IRL Takuvik - CNRS - Université Laval - Sorbonne Université
[8]Trent School of the Environment and Department of Chemistry, Trent University

The recent extensive mining and use of rare earth elements (REE) has increased their influx into aquatic environments, especially towards inland waters. This may become an important ecotoxicological and environmental issue if we are unable to ascertain where and how REE tend to accumulate in the landscape. As such, a better understanding of the mechanisms controlling REE precipitation, dissolution or adsorption is needed to accurately predict their fate in aquatic systems.

Here, our aim is to better understand the processes responsible for REE mobility in lake sediment, using pore water as a sensitive indicator of the reactions occurring within it. Because of the affinity of REE for organic matter (OM), we are focusing on REE interactions with dissolved and colloidal OM along a gradient of primary productivity and OM quality.

We have determined the vertical distribution of REE and other analytes (pH, OM, metals) in the sediment and pore water of three temperate lakes: Tantaré (oligotrophic), Maskinongé (mesotrophic) and Swan (eutrophic). REE concentration profiles in the pore water showed similar features in all lakes, with a subsurface peak between 2 and 6 cm depth, coinciding with the production of pore water Fe and Mn. However, peak concentrations spanned one order of magnitude amongst lakes. They were lower (max 0.33 µg/L) in the eutrophic Swan Lake, and higher (max 22 µg/L) in the oligotrophic Tantaré lake. This might suggest REE mobilisation to the pore water by complexation with dissolved allochthonous OM, during the reductive dissolution of Fe and Mn oxyhydroxides.

These results demonstrate that trophic status inversely controls REE pore water accumulation in temperate lake sediments, contrary to simple OM-loading predictions, and highlight the need to better understand competitive OM-Fe-REE interactions during diagenesis.