Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.35308

Particulate and Dissolved Organic Matter in a Flooded Mica Mine, Quebec (Canada): Sources and Seasonal Dynamics

ELISA PASTIER[1,2], ANTONIN PRIJAC[1,2], YVES GELINAS[1,3], DAVID JACLIN[4], CASSANDRE SARA LAZAR[2,5] AND VIOLAINE PONSIN[1,2,6]

[1]Geotop Research Center
[2]Université du Québec à Montréal (UQAM)
[3]Concordia University
[4]University of Ottawa
[5]Interuniversity Research Group in Limnology (GRIL-UQAM)
[6]EcotoQ

In Canada, mineral resources are of great economic importance. Prior to the 1991 Act, abandoned mines were flooded by groundwater, forming new, fully submerged aquatic habitats. Previous studies of the flooded Blackburn mica mine have shown semi-permanent water column stratification with the presence of a thermocline separating surface waters from deeper waters. In flooded mines, the biogeochemical processes controlling the dynamics of organic matter are still poorly documented. This study examined the origin, transformation and seasonal variability of dissolved organic matter (DOM) and particulate organic matter (POM) using optical markers (SUVA, HIX, BIX, FI, spectral slopes) and molecular indices on alkanes (ACL, CPI, short and long chain distribution). Dissolved organic carbon (DOC) concentrations were higher at the surface and more stable with depth, resulting in a persistent fraction of the DOM in deep waters. The C/N atomic ratios of POM, the increase in SUVA and the decrease in spectral slopes of DOM with depth indicated an enrichment in aromatic and humified compounds. POM showed a duality of autochthonous/terrigenous sources: short n-alkanes (nC_{11}–nC_{16}) reflected microbial and algal production at the surface, while long n-alkanes (nC_{27}–nC_{31}), enriched at depth and with high CPI values, indicated a well-preserved terrigenous contribution. Seasonality structured the DOM: spring showed peaks in DOC and high aromaticity, linked to terrigenous inputs and autotrophic production, summer favoured selective transformation and accumulation of humified fractions, and autumn was associated with higher DOM concentrations, likely reflecting dilution effect and/or increased inputs, with deep waters constituting a stable compartment. These results showed that, in the mine, surface DOM was more influenced by seasonality, whereas the persistent of thermal and chemical stratification promoted DOM preservation and accumulation. This study refines our understanding of organic matter dynamics and supports the conceptual model of the Blackburn mine as a stratified mining lake analogue.