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Environment and Climate Change Canada

Phosphorus Recycling in Lake of the Woods: Biogeochemical Controls across Spatial and Temporal Scale

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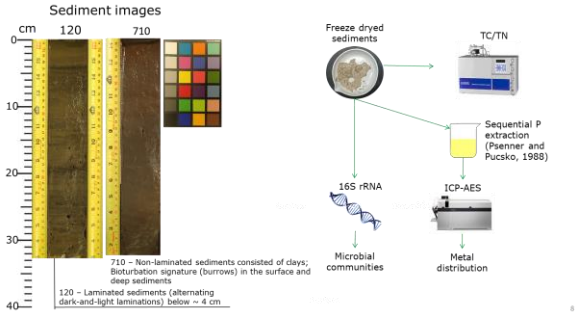
BACKGROUND

- An understanding of the processes occurring in the top few centimeters of the sediment is essential for the assessment of water quality and the management of surface waters
- This study covers Lake of the Woods (LOW), an important source of freshwater, located on the border of Ontario and Manitoba, Canada, and Minnesota, USA
- Water quality has deteriorated with high frequency and intensity of toxin-producing cyanobacterial blooms

The main aims of this study were:

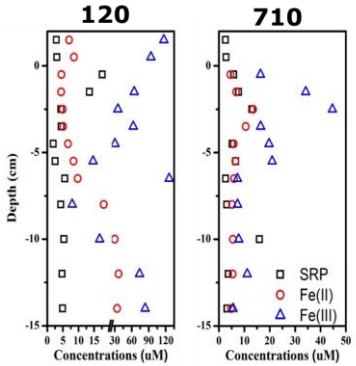
- To identify the dynamics of phosphorus (P) in sediments and
- To gain insight into the geochemical factors and mechanism of P release from sediments under varying environmental conditions

METHODS

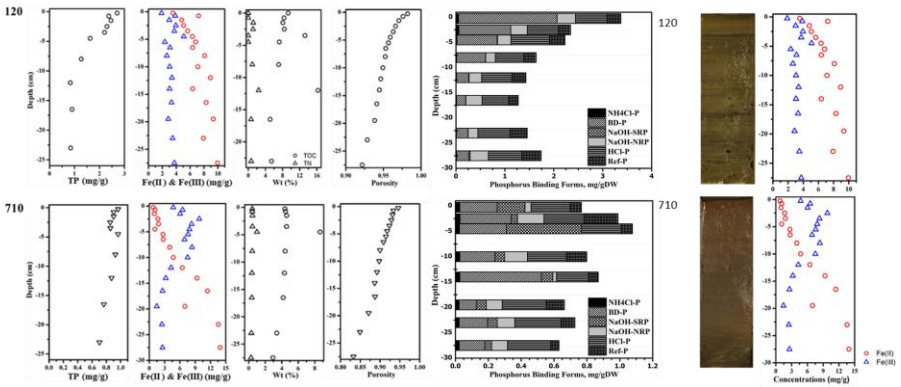


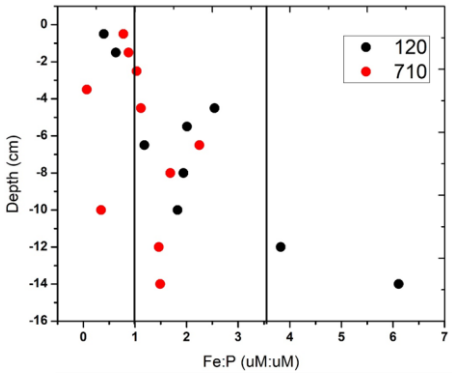
RESULTS and DISCUSSION

Sediment Porewater SRP, Fe(II) and Fe(III)

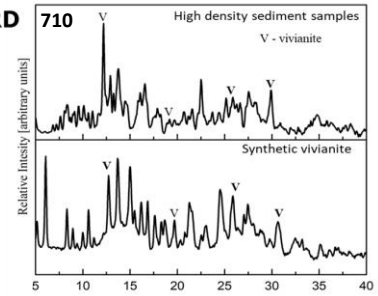


Sediments TP, Fe, TOC, TN and P Binding Forms

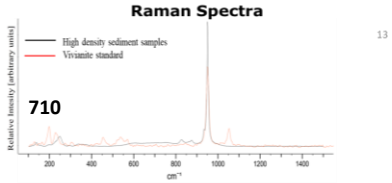




XRD



Raman Spectra



Station	P accumulation (mg m^{-2} d^{-1})	P burial (mg m^{-2} d^{-1})	Long-term Net P release (mg m^{-2} d^{-1})	P retention (%)	P recycling efficiency (%)
120	1.68	0.53	1.15	31	69
710	0.79	0.58	0.21	74	26

CONCLUSIONS

- Internal P loading was likely to be controlled by degradation of organic compounds as well as reductive dissolution of iron oxyhydroxides in stations 120 and 710
- Reactive sediment P pool needs to be considered for lake nutrient management