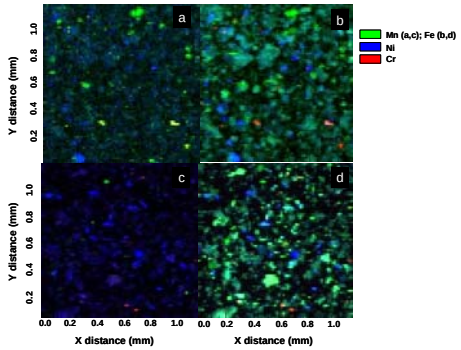
Spectroscopic Investigation of the Microbial Controls on Trace Element Mobility in Iron Rich Equatorial Lacustrine Sediments

C.G WEISENER. [1], S.CROWE [1], D. FOWLE [1] AND J.A ROBERTS.[2]

[1]Great Lakes Institute for Environmental Research, University of Windsor;weisener@uwindsor.ca
[2] Department of Geology, University of Kansas; roberts@KU.edu

Introduction: We have begun a series of studies in tropical lake settings that receive significant inputs of lateritic soils via erosion to study the impact on trace metal mobility in these lakes. Prior selective extraction experiments suggest that a Mn-rich phase serves as an important reservoir of trace elements in the Fe-rich sediment. To confirm this hypothesis we used a combination of electron microscopy and synchrotron based X-ray absorption spectroscopy (XAS) to investigate the samples.

Results: u-XRF maps collected from the samples show the deportment of Mn, Cr, Ni and Fe (a). Ni in the starting material (LS sample) appears as isolated forms and within the Mn rich Phases. Cr is associated with Mn rich regions. (b) the LS sample shows Cr and Ni in the Fe bearing phases. Ni is heterogenously distributed as isolated phases and within the Fe bearing phases. Cr shows no corrleation with Fe. The predominat Ni bearing phase in the LS sample are the Fe oxides with some minor association in Ni –Mn oxide phases. After exposure to the microbial consortia a dramatic alteration for some the principle metal carrying phases occurs. (c) and (d) Shows the distribution of Ni and Cr in the microbial treated sample. The proportion of Mn bearing phases is significantly reduced and the Ni and Cr distributions occur as isolated moieties.



Conclusions: The remobilization of trace metals as a function of microbial activity is supported by the XAS measurements along with the spatial associations provided by the FESEM. This spectroscopic evidence suggests that trace element mobility can be directly associated with DMRB in reducing environments.