☒ **Talk** ☐ **Poster**

Shining Light on Soil Health: Soft X-ray Spectroscopic Studies of Soils

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Several of the grand challenges facing science today involve being able to better manage our Earth's soil resources: Feeding 9 billion people sustainably via intensification of agriculture, preserving our water resources in the face of a changing climate, effectively restoring and rehabilitating damaged ecosystems for future use, and becoming more efficient at the stewardship of nutrients required for living things. Unsurprisingly, agricultural and environmental researchers are increasingly turning to synchrotrons as tools to provide a molecular-level understanding of processes occurring in soils and plants to assist in solving these complex problems. Our group has worked extensively to measure soil samples with soft and tender x-ray beamlines at the Canadian Light Source. This research has required considerable development in detectors, optics, sample environments, and data acquisition software, as well as strong collaborations between academic researchers and CLS beamline scientists.

In this talk, I will share past, present, and future developments in measuring the elements of life (C, N, O, P, S, Ca, Mg, Fe, Cu, Zn) in natural samples. Specifically, research advances in P speciation from relatively routine bulk K-edge measurements to novel P L-edge microprobe results (see fig. 1) will be shared to provide some perspective on past research successes, current research topics and future opportunities for soft and tender x-ray spectroscopy in soil nutrient research. Additionally, I will present some transition metal studies on solutions and mineral suspensions performed in situ at the L-edge with soft x-rays and discuss some of the challenges and opportunities this technique can provide.

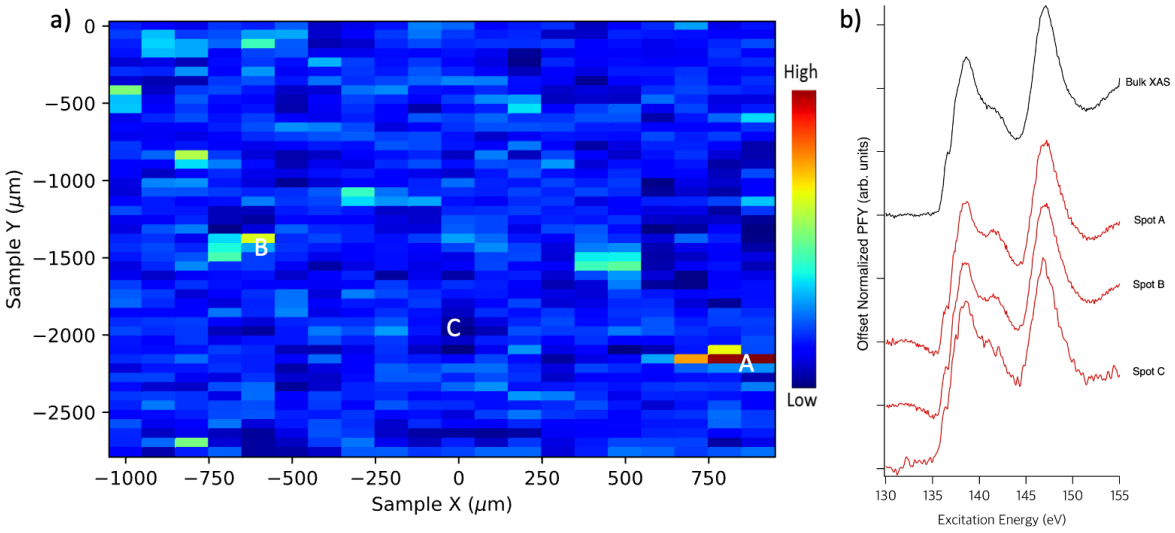

Figure 1. a) P L-edge microprobe map of a cattle manure sample. (b) P L-edge XANES of 3 different spots in sample (a) compared to a bulk XANES spectrum of the same sample.