GEOC: Division of Geochemistry

2 - Synchrotron-based techniques for determining phosphorus speciation in soils

View Session Detail

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Abstract:A fundamental understanding of soil phosphorus (P) speciation is vital for understanding P retention and transport in soils. Although the chemistry of P has been extensively studied, specific mechanisms for P adsorption to soils remain largely unclear. Current methods for soil P speciation rely heavily on sequential chemical extractions which are *ex situ* and can introduce artifacts during the analysis procedure. To overcome limitations of current methods for examining the P speciation, non-invasive spectroscopic techniques can be used to analyze soils *in situ*. This study evaluates synchrotron-based techniques to elucidate mechanisms for P bonding in soils. Agricultural soils have been collected throughout the Chesapeake Bay watershed to examine P speciation. Micro-scale X-ray fluorescence (XRF) imaging and X-ray absorption near-edge spectroscopy (XANES) at the P K-edge has been performed at the X15B beamline at the National Synchrotron Light Source and the 14-3 beamline at Stanford Synchrotron Radiation Lightsource. Initial studies have used XRF to correlate the presence of P with Fe, Ca, and Al. Micro-scale XANES spectra will be compared to spectra of standards with known chemical composition to identify P forms. This research will expand knowledge of P retention in soils to facilitate the identification of management practices to mitigate loss of P to the environment.