GEOC: Division of Geochemistry

111 - Impact of sea level rise on arsenic speciation in *Phragmites australis* and *Spartina alterniflora*

View Session Detail

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Abstract: Coastal wetlands sequester large amounts of heavy metals in their sediments and biomass; however, sea level rise and invasive exotic plant species destabilize marsh ecosystems and may cause previously sorbed contaminants, such as arsenic (As), to be released. Marsh plants can play a critical role in capturing As mobilized by influxes of seawater through direct absorption into root tissue, by sorption of the metals to iron plaques formed around the roots, and incorporation of metals into aboveground biomass. These relationships were tested on *Phragmites* and *Spartina,* which were grown in a controlled growth chamber and exposed to seawater of a given concentration. The experiments were conducted hydroponically and in natural marsh soil. Pore water sampling was used to determine the redox state, pH, and As concentration in the soil experiments. Arsenic in the root plaques was analyzed using a modified dithionite citrate bicarbonate (DCB) method and the total As in plant biomass was measured with inductively coupled plasma optical emission spectrometry (ICP-OES). The distribution/association of As in the roots collected from these experiments was also investigated using synchrotron-based micro-X-ray absorption near edge structure (micro-XANES) and micro-X-ray fluorescence (micro-XRF) spectroscopy, respectively, at the National Synchrotron Light Source, Argonne National Laboratory, and SLAC National Accelerator Laboratory. Roots and outer plaques were analyzed as whole and cryosectioned 30 µm cross-sections to spatially differentiate the oxidation state of the As sorbed on the plaques and absorbed in different regions of the roots. This study provides key insight to more fully understand the impact of sea level rise on the cycling, mobility, and speciation of redox sensitive As and other heavy metals, in contaminated wetlands.