Development of a Rapid, Stable and Inexpensive Monitoring Technique for Porewater Sulfide in the Intertidal Zone

Merritt, K.[1] and Allison, J.[2]
Coastal Marine Environmental Science Program; Corning School of Ocean Studies
Maine Maritime Academy, Castine, Maine, 04420

At temperate latitudes, Spartina-dominated salt marshes exist as a dynamic balance between the rate of sea level rise; the availability of sediment for vertical marsh accretion; and the growth and predominance of specific botanical forms with varying tolerances for salt exposure and rootzone saturation. For these coastal marshes, a limiting condition for healthy growth and sustained function may lie in the frequency, depth and duration of tidal inundation. Specifically, prolonged soil saturation following inundation results in water logging; biogeochemically, water logging In the presence of sulfate (SO_4^{2-}) results in shallowing (shoaling) of the depth of microbial sulfate reduction and resultant accumulation of sulfide with potential impacts on seed germination, plant root development and rhizome propagation.

Monitoring sulfide within the root zone of marsh soils is challenging for reasons including analytical costs, specificity of materials and sample stabilization requirements and temporal limitations on the duration of field deployments. Our research is focused on developing a rapid, stable, and inexpensive method for monitoring sulfide in marsh soils over a concentration range (~ 0.5 – 50 mg/L) relevant for assessing botanical toxicity. Based on the high affinity of silver (Ag) for free sulfide (S) ($K_{sp} = 5 \times 10^{-50}$), the method employs strips of field-deployed photographic paper ("silver gelatin prints") as the monitoring medium. Utilizing this approach and applying freely available software to quantify and chemically characterize the results of stabilized (fixed) and subsequently digitally scanned test strips, short (< ½ hr) field deployments are possible for fine-scale determination of ecologically relevant concentrations of porewater sulfide.

[1]karen.merritt@mma.edu | [2]jacob.allison@mma.edu