PAH Compositions in Sediment Porewater Provide Clues to What We Are Measuring

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Background/Objectives. Porewater is an important interface between contaminated sediments and surface water and provides the best means of characterizing groundwater along a flow pathway that may discharge to surface water. Accordingly, PAH concentrations in porewater are increasingly used as a basis for evaluating risk of contaminated sediments and designing reactive caps for NAPL and MGP sediment sites. Means and methods of characterizing PAHs in porewater have evolved over the past 10 to 20 years. Sampling methods include: ex situ extraction through centrifugation, in situ sampling using piezometers, in situ (and ex situ) passive sampling using semi-permeable polymer media. This presentation presents a closer look at what we are actually measuring in porewater and near-bottom surface water as related to different sampling methods.

Approach/Activities. PAH data from multiple porewater and near-bottom surface water sampling methods are compared to associated sediment data: 1) in situ soild-phase micro extraction (SPME) using polydimethylsiloxane (PDMS) for porewater and overlying surface water; 2) in situ push-point screened piezometers with low-flow porewater sampling and overlying surface water peristaltic pumping direct sampling, with gravity/push sediment cores; 3) gravity/push sediment cores with ex situ centrifugation of porewater; and 4) in situ passive sampling of near-bottom surface water using polyethylene film. The porewater data generated from these different sampling methods are compared with predicted dissolved-phase concentrations and compositions (e.g., using equilibrium partitioning), and then compared with associated sediment PAH compositions. In addition, near-bottom surface water data collected using three different methods are compared with their respective vertical profiles in porewater and associated sediment. All porewater, near-bottom surface water, and associated sediment samples are from former MGP sites on the US West Coast.

Results/Lessons Learned. The comparisons of PAH compositions in collocated porewater, surface water, and sediment are used to evaluate sediment/porewater/surface water interactions and distinguish amongst the following: dissolved-phase upwelling from deep contamination, groundwater discharge, localized sediment contamination, and/or fine colloidal particles entrained in porewater. The pros and cons of time-integrated passive sampling versus in situ direct sampling methods (e.g., screened piezometers) are evaluated in the context of analytical uncertainty and intended data use.