REGIONAL MONITORING
PROGRAM FOR WATER QUALITY
IN SAN FRANCISCO BAY
sfei.org/rmp

RMP Webinar: Passive and Alternative Sampling Methods

January 25, 2017

AGENDA

9:30	Phil Trowbridge (SFEI) Introduction
9:40	Rob Burgess (USEPA) **Sampling for Measuring Freely Dissolved Contaminant Concentrations: An Overview** This overview will discuss several aspects of passive sampling including (i) why use passive sampling methods and what they tell us, (ii) why do we care about the freely dissolved concentration (C_{free}), (iii) types of passive samplers and how they work, (iv) preparing, deploying, recovering, and storing passive samplers, and (v) analyzing and interpreting passive sampling data.
10:00	Rainer Lohmann (University of Rhode Island) **Passive Sampling of Hydrophobic Organic Contaminants in the Great Lakes and Around the World** Polyethylene passive samplers were simultaneously deployed in surface water and near surface atmosphere to assess sources, spatial trends and air-water exchange of organic pollutants in the Great Lakes region from 2011-2014. Legacy pollutants were - by and large - volatilizing from the water; hence the lower Great Lakes acted as a secondary source to the atmosphere. Yet in most cases, on-going sources affected spatial trends of emerging and emerged organic pollutants in the Great Lakes region. Spatial distributions of freely dissolved organic pollutants in Lakes Erie and Ontario were influenced by loadings from contaminated sites and water circulation patterns. AQUA-GAPS will be building on various successful passive sampling campaigns by promoting an international monitoring campaign targeting primarily hydrophobic organic contaminants. AQUA-GAPS is designed as a network of networks based around a central laboratory, RECETOX.
10:20	Zach Cryder (on behalf of Jay Gan, UC Riverside) **Development of Passive Samplers for Measuring Pyrethroids in Surface Water** The synthetic pyrethroid insecticides primarily associate with dissolved organic matter when present in surface water systems due to their hydrophobicity. As a result, it can be difficult to accurately assess the freely dissolved, or bioavailable, concentrations of these compounds via analysis of conventional grab samples. Practical, highly sensitive thin

	film passive samplers were developed and validated in order to provide accurate and precise *in situ* measurements of surface water concentrations of the synthetic pyrethroids. Such ambient measurements will allow for improved exposure assessment for aquatic organisms that are particularly sensitive to these compounds.
10:40	Richard Luthy (and Yeo-Myoung Cho, Stanford University) **Passive Sampling for Measuring Organic Contaminants in Water, Sediment Porewater, and Flux at the Sediment-Water Interface** The presentation will show techniques for measuring sediment porewater concentrations in shallow water and deep water using polyethylene passive samplers. The presentation will illustrate the measurement of very low concentrations to assess natural recovery by deposition of clean sediment in deep water, as well as the response of porewater concentrations from activated carbon amendment to the biologically active layer of a tidal creek.
11:00	Lee Ferguson (Duke University) **Passive and Low-volume Sampling Strategies: Utility for Non-targeted Micropollutant Analysis in Aquatic Systems** The need for collection of large sample volumes and extensive sample preparation (e.g., solid-phase extraction, SPE) prior to non-targeted micropollutant analysis in water and wastewater has typically limited the broad application of this technique for understanding temporal and spatial trends in organic micropollutant occurrence in aquatic systems. We will discuss the utility of two alternative sampling strategies: Polar Organic Contaminant Integrative Samplers (POCIS) and small-volume water collection coupled to online SPE for micropollutant analysis in water and wastewater. Specifically, we will assess the applicability of POCIS sampling to semi-quantitative micropollutant analysis in water and will compare the performance of non-targeted analysis strategies in obtaining comprehensive characterization with POCIS vs. traditional SPE extracts of wastewater and ambient water. Online SPE of low-volume water samples will be presented as an attractive alternative to traditional sampling and analysis for rapid and high-throughput analysis of micropollutants in water, enabling both quantitative and non-targeted analysis with high temporal and spatial resolution. Implications of these approaches for water monitoring and contaminant occurrence surveys will be presented.
11:20	Keith Maruya (SCCWRP) **The Pros and Cons of Field vs. Lab Applications of Passive Sampling** Passive sampling methods (PSMs) are increasingly being used to detect and/or estimate the freely dissolved concentration of organic contaminants in water and sediment. Depending on the goals and scenarios of interest, PSMs can be applied both on site or in the lab, e.g., on field-collected samples. This presentation highlights and contrasts examples of ex situ vs. in situ application of PSMs for investigating occurrence and bioavailability of legacy and emerging contaminants.

11:40 Jamie Aderhold (Aqualytical Services)

CLAM – Active Trace Organics Monitoring

The CLAM continuously pumps water through solid phase extraction media in the field. Typical deployments are 6-24 hours in length, providing 20-90 liter samples.Only a small disk goes back to the lab that is not subject to 7 day holding times and can be frozen before analysis.Volume of water extracted provides measured average concentrations over the deployment time.With large volume samples, standard laboratory methods provide low detection limits. Strengths and weaknesses will be discussed with 3rd party data presented on projects for PCBs, PBDEs, CECs and pesticides.

12:00 Rolf Halden & Erin Driver (Arizona State University)

***In Situ* Active Sampling Devices for Environmental Waters**

Two submersible active sampling devices were developed to enable more precise and cost-effective means of sampling environmental waters. The *In Situ* Sampler (IS2) is designed to sample groundwater or surface water, and the *In Situ* Sampler for Biphasic Water Monitoring (IS2B) is designed to sample sediment pore water and surface water simultaneously. Both instruments use for analyte retention and concentration affordable, commercial solid phase extraction (SPE) cartridges that are applicable to a broad range of organic and inorganic contaminants. Both instruments employ programmable syringe pumps capable of flow rates ranging from 10s to 10,000s of µL min^{-1}, with pause emplacement options, providing the user with broad sample rate flexibility. The flow-through design reduces hazardous waste generation, transportation costs, and the carbon footprint of environmental sampling by 90–98% compared to traditional liquid sampling and shipping. The IS2 is designed for dynamic groundwater and surface water systems where discrete sampling may not capture temporal variations in contaminant levels, potentially leading to under- or over-estimation of risk. The IS2B is optimal for evaluation of chemical partitioning in dynamic conditions extant at the sediment-water interface and for determining bioavailability of contaminants. *In situ* extraction improves capture of trace-level contaminants and reduces the risk of artifacts introduced by sample handling and processing; also, immobilization of concentrated analytes on collection resins increases sample holding times and yields ultra-low reporting limits not achievable with traditioinal techniques. Additionally, i*n situ* SPE allows for determination of truly bioavailable compounds whether fully dissolved, *or* partitioned onto dissolved organic matter, colloids, and suspended particulates. Recent field validations include a 28-day sampling event in a Cr(VI)-impacted tidally-influenced aquifer, and fate of the pesticide fipronil (and associated degradates) in a constructed wetland used as quaternary treatment for wastewater effluent.

12:20 Wrap Up