

# PFAS Sentinel Passive Samplers

April 18, 2024

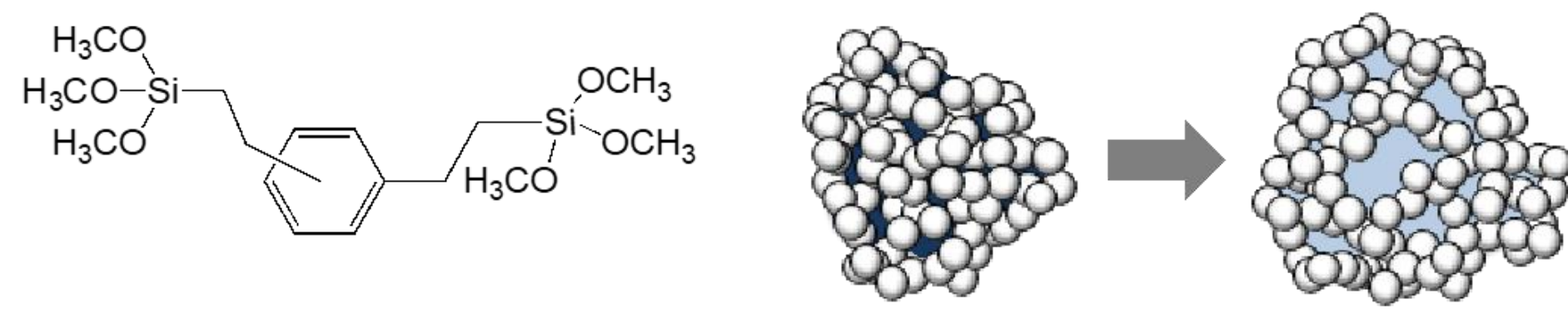
## OBJECTIVES

Laboratory and field studies conducted under SERDP Project ER20-1127, with key objectives including:

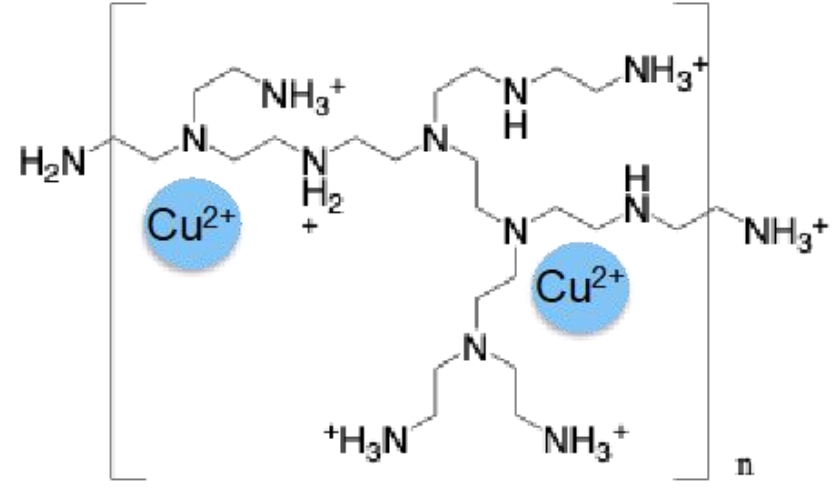
- Establish physical-chemical properties of Osorb™ passive sampler media, including sorbent/water partition coefficients and molecular diffusivities of PFAS in water and sorbent media.
- Develop robust passive sampler prototype(s) that yield representative results.
- Develop field procedures for efficiency deployment and retrieval in groundwater and surface waters.
- Develop testing methods that can be applied in any academic or DoD-accredited commercial analytical laboratories.

## PASSIVE SAMPLER DESIGN

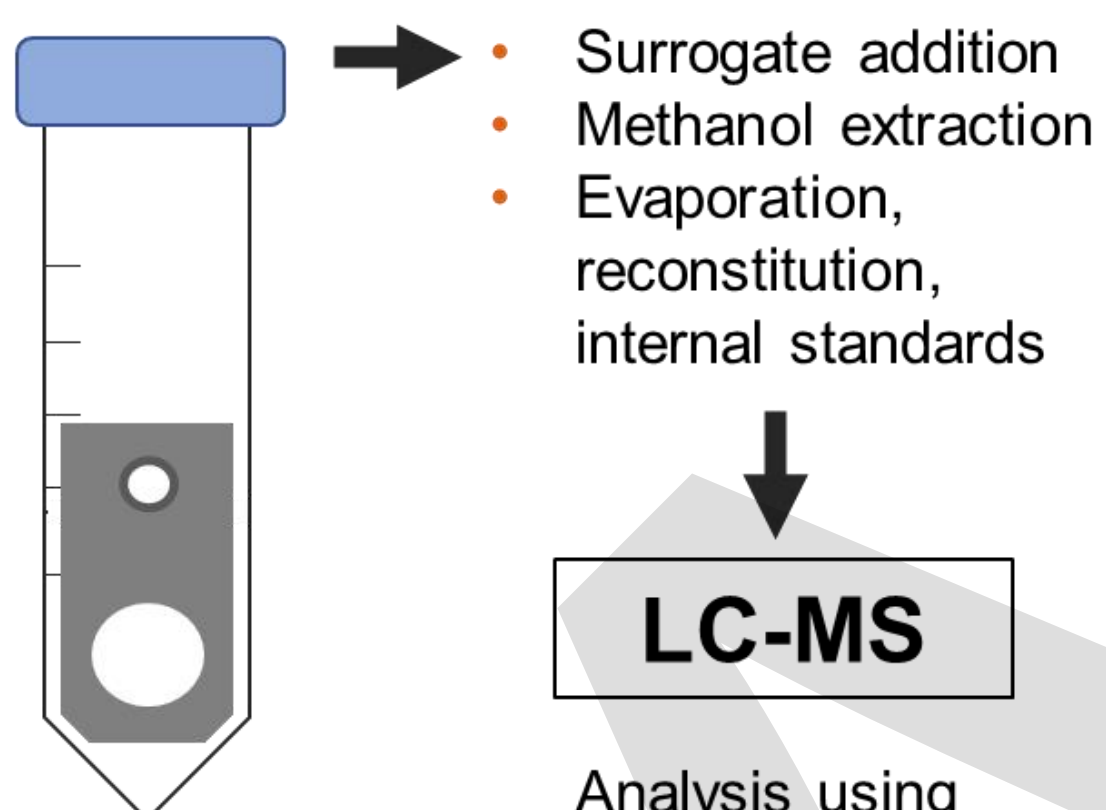
1: Swellable **hydrophobic** particles



2: Polyethylenimine polymer inclusion, **ion exchange**



3: Bound Cu(II) ions: **increases charge density, anti-fouling**

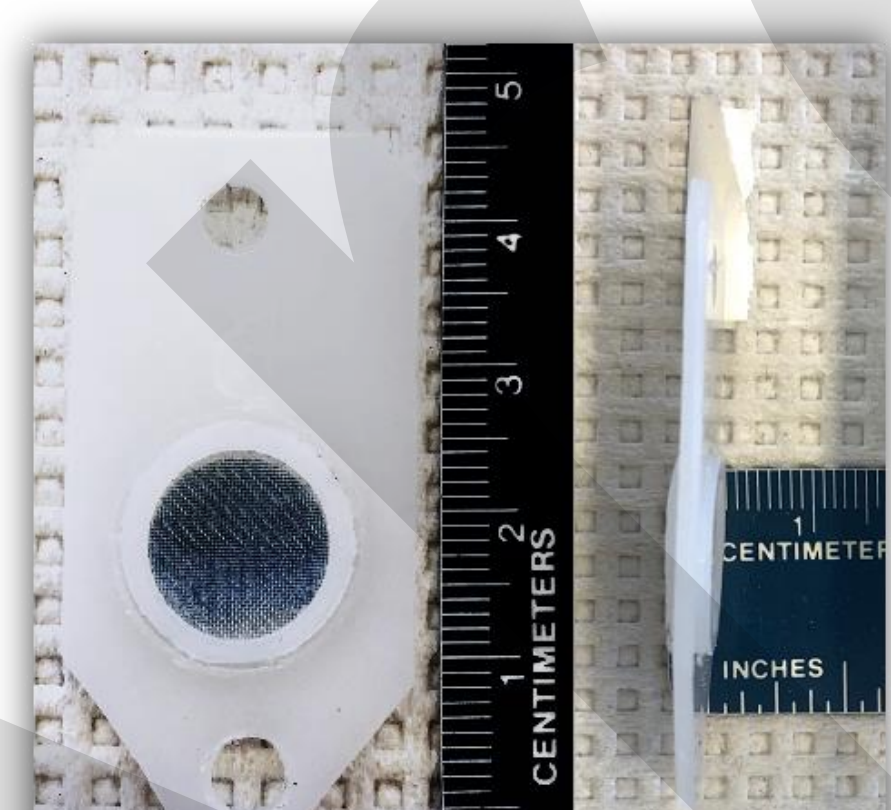


Sampler recovered and shipped in standard centrifuge tube.

Passive sampler laboratory analysis steps parallel steps of aqueous sample analysis.

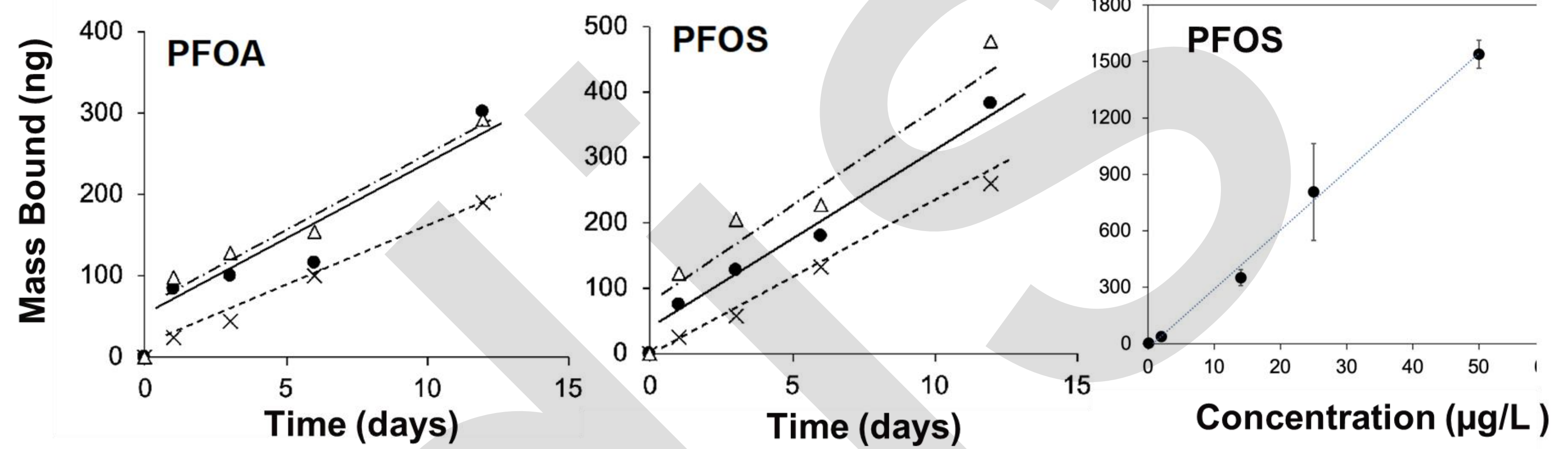
LC-MS

Analysis using HPLC-MS/MS or total organofluorine methods.



Polyethylene construction with 80-mesh granular Cu(II)-polyethylenimine-Osorb® adsorbent

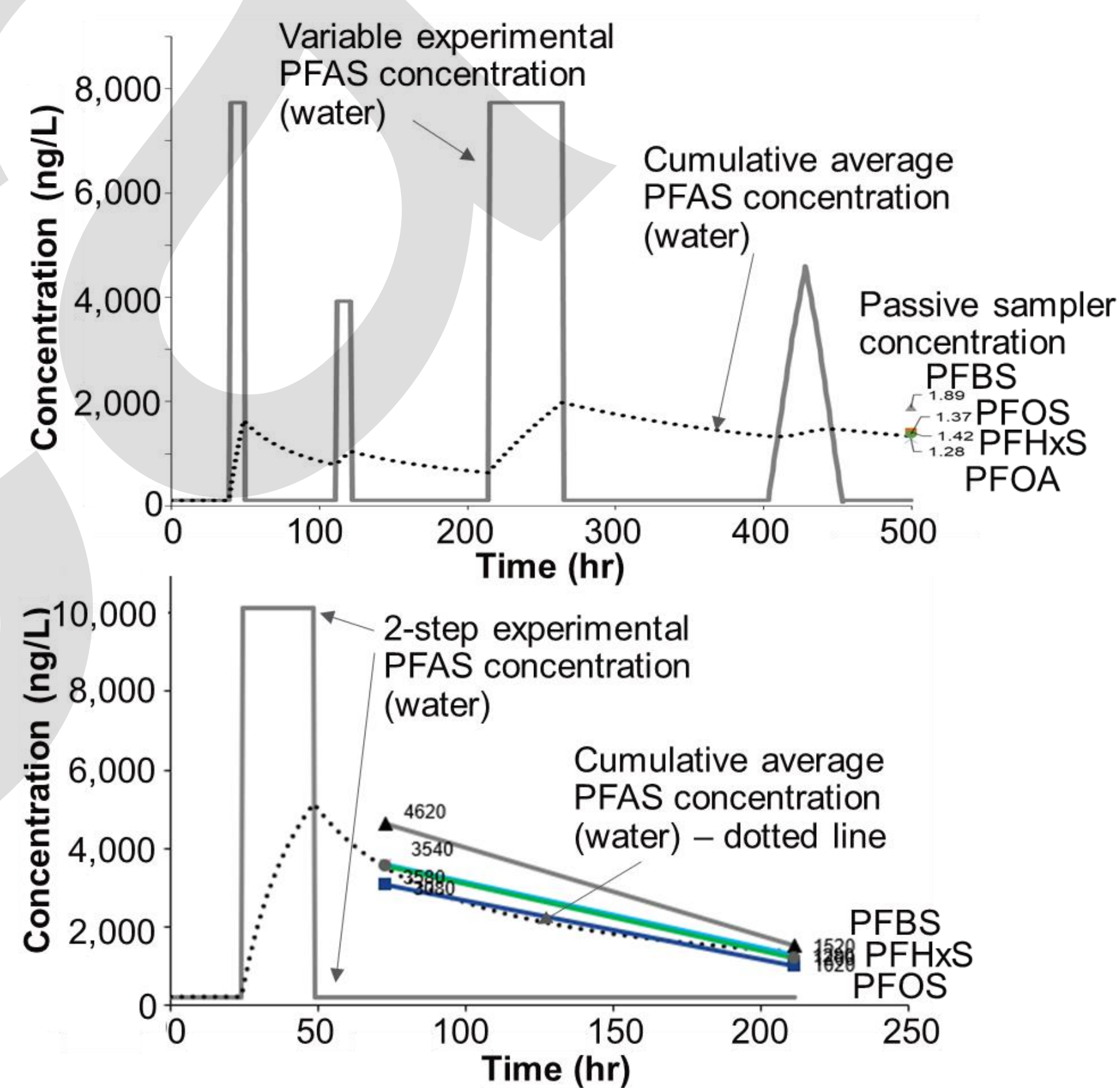
## LABORATORY RESULTS



Mass of PFAS accumulated as a function of time in simulated groundwater, 1 µg/L PFAS, T=25°C. Flow rates varied: 0.038 cm/min (cross), 0.38 cm/min (circle), 1.9 cm/min (triangles). Uptake is linear.

Mass of PFOS accumulated as a function of concentration. Uptake is linear.

- Consistent and fast uptake rates show applicability to a **wide range of environmental water types**, ~2 week deployment.
- Largely insensitive to water ionic strength, pH, and TOC
- Integrative sampling nature useful for providing concentration **values that are time-averaged**.

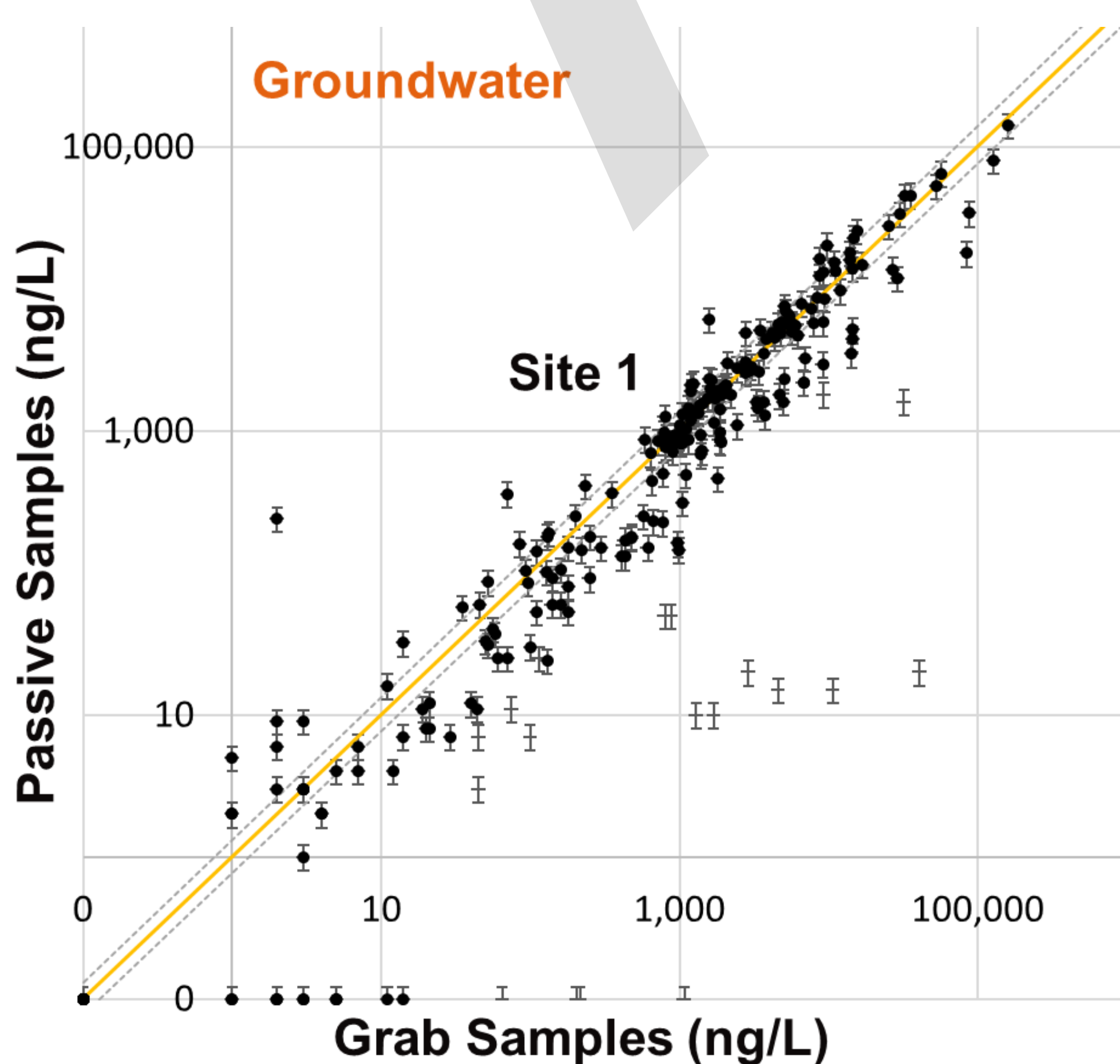


PFAS concentration profile during variable-concentration experiments demonstrate integrative (time-weighted) behavior of passive sampler.

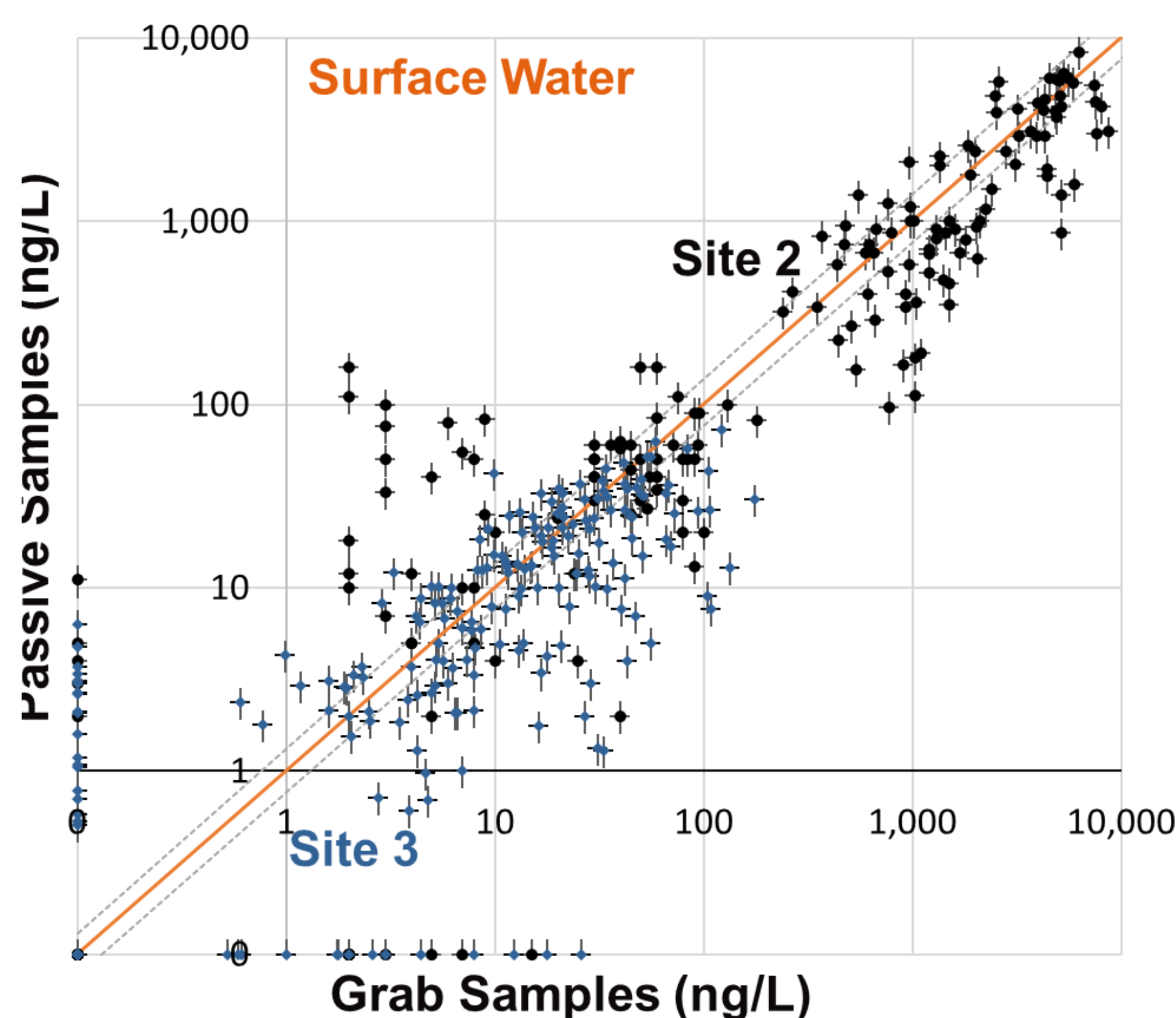


Field deployments in groundwater and surface water

## FIELD RESULTS



Groundwater: Median relative percent difference (RPD) of 38% (passive – grab detect pairs), 90% of detect pairs within 108% RPD.



- Overall 1:1 correspondence over 5+ orders of magnitude
- Equivalent performance for short- and long-chain PFAS compounds in groundwater and surface water
- Surface water grab samples represent snapshots in time. Passive samplers represent time-weighted average.