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Using performance reference compound-corrected polyethylene passive samplers and caged bivalves to measure hydrophobic contaminants of concern in urban coastal seawaters

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ABSTRACT

Low-density polyethylene (PE) passive samplers containing performance reference compounds (PRCs) were deployed at multiple depths in two urban coastal marine locations to estimate dissolved concentrations of hydrophobic organic contaminants (HOCs), including dichlorodiphenyltrichloroethane (DDT) and its metabolites, polychlorinated biphenyl (PCB) congeners, and polybrominated flame retardants. PE samplers pre-loaded with PRCs were deployed at the surface, mid-column, and near bottom at sites representing the nearshore continental shelf off southern California (Santa Monica Bay, USA) and a mega commercial port (Los Angeles Harbor). After correcting for fractional equilibration using PRCs, concentrations ranged up to 100 pg L_1 for PCBs and polybrominated diphenyl ethers (PBDEs), 500 pg L_1 for DDMU and 300 pg L_1 for DDNU, and to 1000 pg L_1 for p,p0-DDE. Seawater concentrations of DDTs and PCBs increased with depth, suggesting that bed sediments serve as the source of water column HOCs in Santa Monica Bay. In contrast, no discernable pattern between surface and near-bottom concentrations in Los Angeles Harbor was observed, which were also several-fold lower (DDTs: 45–300 pg L_1, PCBs: 5– 50 pg L_1) than those in Santa Monica Bay (DDTs: 2–1100 pg L_1, PCBs: 2–250 pg L_1). Accumulation by mussels co-deployed with the PE samplers at select sites was strongly correlated with PE-estimated seawater concentrations, providing further evidence that these samplers are a viable alternative for monitoring of HOC exposure. Fractional equilibration observed with the PRCs increased with decreasing PRC molar volume indicating the importance of target compound physicochemical properties when estimating water column concentrations using passive samplers in situ.