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Passive sampling to measure baseline dissolved persistent organic pollutant concentrations in the water column of the Palos Verdes shelf superfund site

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ABSTRACT

Passive sampling was used to deduce water concentrations of persistent organic pollutants (POPs) in the vicinity of a marine Superfund site on the Palos Verdes Shelf, California, USA. Precalibrated solid phase microextraction (SPME) fibers and polyethylene (PE) strips that were preloaded with performance reference compounds (PRCs) were codeployed for 32 d along an 11-station gradient at bottom, surface, and midwater depths. Retrieved samplers were analyzed for DDT congeners and their breakdown products (DDE, DDD, DDMU, and DDNU) and 43 PCB congeners using GC-EI- and NCI-MS. PRCs were used to calculate compound-specific fractional equilibration achieved in situ for the PE samplers, using both an exponential approach to equilibrium (EAE) and numerical integration of Fickian diffusion (NI) models. The highest observed concentrations were for *p,p'*-DDE, with 2200 and 990 pg/L deduced from PE and SPME, respectively. The difference in these estimates could be largely attributed to uncertainty in equilibrium partition coefficients, unaccounted for disequilibrium between samplers and water, or different time scales over which the samplers average. The concordance between PE and SPME estimated concentrations for DDE was high ($R^2 = 0.95$). PCBs were only detected in PE samplers, due to their much larger size. Near-bottom waters adjacent to and down current from sediments with the highest bulk concentrations exhibited aqueous concentrations of DDTs and PCBs that exceeded Ambient Water Quality Criteria (AWQC) for human and aquatic health, indicating the need for future monitoring to determine the effectiveness of remedial activities taken to reduce adverse effects of contaminated surface sediments.

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