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Significance of sediment resuspension and tidal exchange to reduction of polychlorinated biphenyl mass in San Diego Bay, California

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ABSTRACT

Sediments in San Diego Bay (SDB) are known to contain high levels of polychlorinated biphenyls (PCBs), but concentrations are declining. To understand the association of hydrological processes with this trend, we simultaneously measured radioisotopes ²¹⁰Pb, ²¹⁰Po, ²³⁴Th, ¹³⁷Cs, and ²²⁶Ra, as well as PCBs, in samples collected from the sediments and water column of SDB to investigate the resuspension and redistribution of PCBs within SDB. Radioisotope activity and water content in the sediment were highly heterogeneous, indicating an extensively disturbed sedimentation history. Water column distributions of ²¹⁰Pb and ²¹⁰Po suggested strong sediment resuspension, particularly in the northern and southern areas of the bay (North and South Bays, respectively). Particle residence time derived from water column ²³⁴Th activities was about 10 d, deemed sufficient for suspended PCBs to be mobilized to areas where they could be further transported out of SDB via extensive tidal exchange. The observed fractionation with ²¹⁰Pb and ²¹⁰Po near the bay mouth provided further evidence of strong tidal exchange near the bay mouth, where dilution of PCB concentrations was observed. These data suggest that natural hydrological processes, combined with shipping and dredging activities, were at least partially responsible for the reduction of PCB contamination in SDB.

Full Text

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