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Passive-Sampler-Derived PCB and OCP Concentrations in the Waters of the World—First Results from the AQUA-GAPS/MONET Network

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ABSTRACT

Persistent organic pollutants (POPs) are recognized as pollutants of global concern, but so far, information on the trends of legacy POPs in the waters of the world has been missing due to logistical, analytical, and financial reasons. Passive samplers have emerged as an attractive alternative to active water sampling methods as they accumulate POPs, represent time-weighted average concentrations, and can easily be shipped and deployed. As part of the AQUA-GAPS/MONET, passive samplers were deployed at 40 globally distributed sites between 2016 and 2020, for a total of 21 freshwater and 40 marine deployments. Results from silicone passive samplers showed α-hexachlorocyclohexane (HCH) and γ-HCH displaying the greatest concentrations in the northern latitudes/Arctic Ocean, in stark contrast to the more persistent penta (PeCB)- and hexachlorobenzene (HCB), which approached equilibrium across sampling sites. Geospatial patterns of polychlorinated biphenyl (PCB) aqueous concentrations closely matched original estimates of production and use, implying limited global transport. Positive correlations between log-transformed concentrations of Σ_7PCB,

ΣDDTs, Σendosulfan, and Σchlordane, but not ΣHCH, and the log of population density (p < 0.05) within 5 and 10 km of the sampling sites also supported limited transport from used sites. These results help to understand the extent of global distribution, and eventually time-trends, of organic pollutants in aquatic systems, such as across freshwaters and oceans. Future deployments will aim to establish time-trends at selected sites while adding to the geographical coverage.