

AQUA-GAPS/MONET-derived concentrations and trends of PAHs and polycyclic musks across global waters

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Abstract

Polycyclic aromatic hydrocarbons (PAHs), released from petrogenic, pyrogenic or diagenetic sources (degradation of wood materials), are of global concern due to their adverse effects, and potential for long-range transport. While dissolved PAHs have been frequently reported in the literature, there has been no consistent approach of sampling across water bodies. Passive samplers from the AQUA/GAPS-MONET initiative were deployed at 46 sites (28 marine and 18 freshwater), and analyzed for 28 PAHs and six polycyclic musks (PCMs) centrally. Freely dissolved PAH concentrations were dominated by phenanthrene (mean concentration 1500 pg L⁻¹; median 530 pg L⁻¹) and other low molecular weight compounds. Greatest concentrations of phenanthrene, fluoranthene, and pyrene were typically from the same sites, mostly in Europe and North America. Of the PCMs, only galaxolide (72% of samples) and tonalide (61%) were regularly detected, and were significantly cross-correlated. Benchmarking of PAHs relative to penta- and hexachlorobenzene confirmed that the most remote sites (Arctic, Antarctic, and mountain lakes) displayed below average PAH concentrations. Concentrations of 11 of 28 PAHs, galaxolide and tonalide were positively correlated ($P < 0.05$) with population density within a radius of 5 km of the sampling site. Characteristic PAH ratios gave conflicting results, likely reflecting multiple PAH sources and postemission changes.