

Quantifying the residence time and accumulation of sediment-bound contaminants in coastal Louisiana using natural radioisotope tracers

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Residence time estimates of PAHs and related organic contaminants in coastal ocean are limited. PAHs and many other chemicals like organochloride pesticides have low aqueous solubility and high partition coefficients. They are readily ‘sorbed’ to certain particles, and are subsequently scavenged and deposited to bottom sediments or transported to the deeper ocean. In the current work we utilize naturally occurring particle reactive ^{210}Po - ^{210}Pb radioisotopes in conjunction with PAH data to estimate for the first time, the particulate PAH residence time in water column and their accumulation in sediments of coastal Louisiana.

The concentrations of particulate PAH varied between 0.92 to 7.04 ng/L during our sampling period and showed strong positive correlation ($R^2=0.93$) with POC, indicating that the concentrations and transport of POC plays an important role in distribution of PAH in marine systems. Particulate ^{210}Po and POC were also found to be significantly correlated ($R^2=0.94$) which allowed ^{210}Po to be utilized as a tracer of particle bound PAHs in the water column. The residence time of ^{210}Po varied between 3 – 35 days and found to increase progressively from shallow shelf to deeper slope region. ^{210}Po residence time in conjunction with the distribution coefficient ratio of $K_{d-\text{Po}}/K_{d-\text{PAH}}$ allowed us to estimate particulate PAHs residence time in this region. The subsequent accumulation of PAH in the sediments were found to vary between 6–55 ng cm⁻² y⁻¹.