In March, 1998, an intense, northerly wind-driven storm created a well-developed plume of contaminated sediment that was observed to extend over the entire coastline of the southern basin of Lake Michigan (~300 km). The effect of this plume event on the cycling of contaminants (organo-compounds (SOCs)) was investigated using a two-pronged sampling strategy. First, discrete air and water samples were collected during intensive campaigns before and after the appearance of the resuspension event. Second, settling sediment was collected using a time-integrated sediment trap which collected settling material before, during, and after the resuspension event. Data from the discrete samples indicated that concentrations of dissolved phase PCBs (sum of 47 polychlorinated biphenyls) declined significantly (±0.05) from 213.3 ng/L ± 34.4 ng/L before the event to 126.4 pg/L ± 68.6 pg/L after the event. Dissolved phase PAHs (sum of 15 polycyclic aromatic hydrocarbons) decreased from 177 ng/L ± 9.5 ng/L to 107 ng/L ± 10.7 ng/L. Data from the sediment traps were used to estimate continuous change in dissolved phase concentration. Using sediment/water partition coefficients calculated from the discrete sampling, and organic carbon normalized PCB and PAH concentrations on the trap material, we have predicted dissolved phase concentrations on the trap material. We have predicted dissolved phase concentrations over six months at the same location. Under both a strategic approach to estimating the dissolved concentration, we have estimated the effect of the resuspension event on atmospheric deposition. The estimated loading from increased gas-phase deposition due to the resuspension event was 8 kg for PCBs and 2200 kg for PAHs over the 48-day lifetime of the northerly event. For PCBs, this short-term load represents ~5% of a recent annual net deposition of 2PCBs to a similar area. The increased gas-phase deposition estimated for PCBs is a large portion of previous dry deposition flux estimates to the entire lake on an annual scale (~11 to 610). The magnitude of this effect is partly a result of high atmospheric concentrations measured near the Chicago/Gary and Milwaukee areas.

**RESULTS**

Increased Atmospheric Deposition of SOCs Due to Large-Scale Sediment Resuspension in Southern Lake Michigan

Jere L. Bogdan, Keri C. Hornbuckle, and Judith W. Budd

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**ABSTRACT**

In March, 1998, an intense, northerly wind-driven storm created a well-developed plume of contaminated sediment that was observed to extend over the entire coastline of the southern basin of Lake Michigan (~300 km). The effect of this plume event on the cycling of contaminants (organo-compounds (SOCs)) was investigated using a two-pronged sampling strategy. First, discrete air and water samples were collected during intensive campaigns before and after the appearance of the resuspension event. Second, settling sediment was collected using a time-integrated sediment trap which collected settling material before, during, and after the resuspension event. Data from the discrete samples indicated that concentrations of dissolved phase PCBs (sum of 47 polychlorinated biphenyls) declined significantly (±0.05) from 213.3 ng/L ± 34.4 ng/L before the event to 126.4 pg/L ± 68.6 pg/L after the event. Dissolved phase PAHs (sum of 15 polycyclic aromatic hydrocarbons) decreased from 177 ng/L ± 9.5 ng/L to 107 ng/L ± 10.7 ng/L. Data from the sediment traps were used to estimate continuous change in dissolved phase concentration. Using sediment/water partition coefficients calculated from the discrete sampling, and organic carbon normalized PCB and PAH concentrations on the trap material, we have predicted dissolved phase concentrations on the trap material. We have predicted dissolved phase concentrations over six months at the same location. Under both a strategic approach to estimating the dissolved concentration, we have estimated the effect of the resuspension event on atmospheric deposition. The estimated loading from increased gas-phase deposition due to the resuspension event was 8 kg for PCBs and 2200 kg for PAHs over the 48-day lifetime of the northerly event. For PCBs, this short-term load represents ~5% of a recent annual net deposition of 2PCBs to a similar area. The increased gas-phase deposition estimated for PCBs is a large portion of previous dry deposition flux estimates to the entire lake on an annual scale (~11 to 610). The magnitude of this effect is partly a result of high atmospheric concentrations measured near the Chicago/Gary and Milwaukee areas.

**STRATEGY**

**HYPOTHESES:**

1. The plume is made up of contaminated sediments. When resuspended, the sediments contaminate the water. This enrichment of the water causes increased short-term volatilization of SOCs.

2. The plume is made up of clean sediments. When resuspended, the particles adsorb or scour SOCs from the water to the particles. This scavenging of the water causes increased short-term deposition.

**SAMPLEING STRATEGY**

In March, 1998, an intense, northerly wind-driven storm created a well-developed plume of contaminated sediment that was observed to extend over the entire coastline of the southern basin of Lake Michigan (~300 km). The effect of this plume event on the cycling of contaminants (organo-compounds (SOCs)) was investigated using a two-pronged sampling strategy. First, discrete air and water samples were collected during intensive campaigns before and after the appearance of the resuspension event. Second, settling sediment was collected using a time-integrated sediment trap which collected settling material before, during, and after the resuspension event. Data from the discrete samples indicated that concentrations of dissolved phase PCBs (sum of 47 polychlorinated biphenyls) declined significantly (±0.05) from 213.3 ng/L ± 34.4 ng/L before the event to 126.4 pg/L ± 68.6 pg/L after the event. Dissolved phase PAHs (sum of 15 polycyclic aromatic hydrocarbons) decreased from 177 ng/L ± 9.5 ng/L to 107 ng/L ± 10.7 ng/L. Data from the sediment traps were used to estimate continuous change in dissolved phase concentration. Using sediment/water partition coefficients calculated from the discrete sampling, and organic carbon normalized PCB and PAH concentrations on the trap material, we have predicted dissolved phase concentrations on the trap material. We have predicted dissolved phase concentrations over six months at the same location. Under both a strategic approach to estimating the dissolved concentration, we have estimated the effect of the resuspension event on atmospheric deposition. The estimated loading from increased gas-phase deposition due to the resuspension event was 8 kg for PCBs and 2200 kg for PAHs over the 48-day lifetime of the northerly event. For PCBs, this short-term load represents ~5% of a recent annual net deposition of 2PCBs to a similar area. The increased gas-phase deposition estimated for PCBs is a large portion of previous dry deposition flux estimates to the entire lake on an annual scale (~11 to 610). The magnitude of this effect is partly a result of high atmospheric concentrations measured near the Chicago/Gary and Milwaukee areas.

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