

ATMOSPHERIC DEPOSITION OF MERCURY, TRACE METALS AND MAJOR IONS IN THE PENSACOLA BAY WATERSHED

Caffrey, J.M. (University of West Florida), Cleveland, S. (Florida Department of Environmental Protection), Gosnell, K. (Florida State University), Landing, W.M. (Florida State University)
Center for Environmental Diagnostics and Bioremediation,
University of West Florida, 11000 University Parkway
Pensacola, FL 32514

ABSTRACT

Atmospheric deposition of mercury, trace metals and major ions have been monitored in the Pensacola Bay watershed to evaluate the temporal and spatial patterns in atmospheric wet deposition. A goal of this project was to evaluate the contribution of local sources (coal fired power plant and paper mill) to atmospheric deposition. Three sites were established in November 2004 to collect rainfall from individual rain events. Total mercury concentrations in the rainwater samples range from 2-40 ng/L. The annual volume weighted mean rainfall Hg concentrations were 9.5 and 11.9 ng/L in 2005 and 2006, respectively. There were no significant differences in the rainfall Hg flux between the three sites or between the Pensacola Bay sites and nearby Mercury Deposition Network monitoring sites in Alabama. Volume weighted mean pH values at the three sites ranged from 4.1 to 5.4. Sulfate concentrations and pH values were negatively correlated as were nitrate and pH. There were no consistent differences in pH or sulfate concentrations among the different sites from Pensacola Bay or the National Atmospheric Deposition (NADP) sites in Mobile and the panhandle of Florida. However, nitrate concentrations in Pensacola Bay were higher than nearby NADP sites. The marine influence is evident at two sites near Pensacola Bay, which had higher chloride and sodium concentrations than an inland site and much higher chloride and sodium deposition than nearby NADP sites. Chloride and sodium concentration were significantly positively correlated. The ratio of chloride to sodium concentrations in Pensacola Bay rain samples is identical to the ratio of seawater. We use principal components factor analysis to identify trace elements which cluster with mercury. Preliminary analyses suggest that there are four factors associated with the mercury and trace element deposition: the Al-Si (crustal abundance) factor, the sea-salt factor, the "P" factor (linking phosphorus with copper and zinc, possibly from agriculture) and the Hg factor. The Hg factor clusters Hg with five trace elements: Ga, Bi, Sb, Pb and V. Bi and Sb are volatiles that we assume come from coal combustion. Ga, V and Pb may also come from coal combustion.

KEYWORDS

Atmospheric deposition, mercury, trace metals, acid rain, sea salt aerosols, principal components analysis