Presentation type:

Poster

Track:

Special Symposium

Session:

TVA Kingston Fly Ash Release: Environmental Studies in Progress

Abstract Title:

Water quality monitoring of the Emory and Clinch Rivers: the impact of the Tennessee Valley Authority coal ash spill, Kingston, TN

Authors:

L. Ruhl - Duke University, Division of Earth and Ocean Sciences, Durham, NC

A. Vengosh - Duke University, Division of Earth and Ocean Sciences, Durham, NC

G.S. Dwyer- Duke University, Division of Earth and Ocean Sciences, Durham, NC

A. Deonarine- Duke University, Civil and Environmental Engineering, Durham, NC

H. Hsu-Kim- Duke University, Civil and Environmental Engineering, Durham, NC

Abstract:

An investigation of the environmental impact of the largest coal ash spill in US history at the Tennessee Valley Authority (TVA) Kingston coal-burning power plant has revealed that leaching of the coal combustion products (CCPs) caused contamination of surface waters in areas of restricted water exchange, but only trace levels were found in the downstream Emory and Clinch Rivers due to river dilution (Ruhl et al., 2009). Our initial findings have indicated that CCP leaching can be traced by several geochemical and isotopic indicators such as As, B, Sr, SO_4 ions. Leaching experiments of TVA ash over a wide range of pH conditions have confirmed the high mobility of these elements from CCPs and the unique isotopic characteristics of boron ($^{11}B/^{10}B$) in these leachable coal ash contaminants (LCAC). These geochemical and isotopic fingerprints were also measured in the highly contaminated water from the spilled area with restricted water exchange. The distinctive boron isotope composition of the LCAC provides a novel geochemical tool for quantifying the CCP impact on the environment. We have continued to monitor the water and sediment quality of the downstream segments of Emory and Clinch Rivers (January to August 2009). The data that emerged so far has shown that the low levels of LCAC have been maintained in the river and remained below the EPA MCL thresholds. In several sites in the downstream river we were able to identify higher concentrations of LCACs (e.g., As ~4 ppb) relative to the background levels, which indicates leaching and transport of LCACs in the river water. A time series of LCACs reveals a peak in June 2009, which could be related to changes in the river flow. Total Hg concentrations in the ash have been measured at 139 and 145 µg/kg, and in sediment downstream of the spill at 45 to 130 µg/kg. In spite of these high concentrations in the downstream sediments, surface water Hg concentrations downstream of the spill were relatively low; total Hg ranged from <0.25 to 5.3 ng/L and

total methylmercury ranged from <0.01 to 0.75 ng/L. In summary, the data show that under the current hydrological conditions (2009) ash dredging in the Emory and Clinch Rivers has not caused a major change in the surface water quality.

*Ruhl, L., Vengosh, A., Dwyer, G.S., Hsu-Kim, H., Deonarine, A., Bergin, M., and Kravchenko, J., 2009. A Preliminary Investigation of the Environmental and Health Effects of the Coal Ash Spill at Kingston, Tennessee. *Environ. Sci. Technol*. 43, 6326-6333.