Resolution of Contributions of Primary Particle Constituents from Individual Power Plants with SEAS

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Summary

Aerosol samples were collected at 30 minute intervals at Clifton Park, MD, for a total of 35 days in July, August, and September, 2001, using the new University of Maryland High-Frequency Aerosol Slurry Sampler (1), as a part of the Baltimore Supersite Project. The sampler was operated at 90 LPM with an aerosol inlet designed to exclude particles larger than 1.25 μm. Meteorological data, including wind speed and direction, were acquired continuously during the sampling periods. Successive 30 minute slurry samples collected on June 6, 7, 8, 9, and10 were analyzed for 14 elements, including Se and Ni, i.e., markers of primary particles emitted from coal and oil combustion, using Graphite Furnace Atomic Absorption Spectrometry.

Clifton Park is located in a primarily residential area of Northeast Baltimore. More than 40 industrial facilities, including, a steel mill and several utility power plants are located along the Patapsco River in South Baltimore. Two large utility power stations, i.e., BG&E's Brandon Shores (PM10 emissions are 924 tons/yr) and the BG&E Wagner Station lie at an angle of 165°, and about 16 km from Clifton Park. From June 6 through 10th, winds were typically light and from east-northeast to easterly during the early morning hours. After sunrise, wind speed typically increased and turned to more southerly directions, i.e., 150 to 250°. Selenium (Se) concentrations peaked regularly when winds arrived at Clifton Park from directions ranging from approximately 150 to 220°. This is most surely the influence of plumes from the BG&E Brandon Shores and Wagner stations. As indicated, peak Se concentrations were as large as 12 ng/m^3, i.e, about 12-fold greater than Se background concentrations, which were typically about 1±1 ng/m^3. Clearly, the daily average concentration (2.2 ng/m^3,) was strongly affected by fumigation by these plumes. This is, perhaps, important as it indicates that one or two sources might dominate human exposure to certain pollutants. Ni concentrations were also somewhat elevated during most of the same periods as Se. This is surely attributable to emissions from an oil-fired boilers at the Wagner Utility station. As Wagner burns oil and coal while Brandon shores burns only coal, their contributions should be resolvable by factor analysis or CMB methods. The data clearly demonstrate the resolving power of highly-time resolved concentration data for species that are unique or nearly unique markers of primary emissions from anthropogenic sources such as coal- and oil-fired power plants.

1. Kidwell, C. B., Ondov, J. M. (2001) Development and Evaluation of a Prototype System for Collecting Sub-Hourly Ambient Aerosol for Chemical Analysis. *Aerosol Sci. Technol. 35:596-601.*