

Effects of Wind Direction on Trace Metal Concentration in Southeast Kansas

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ABSTRACT

Field data for PM₁₀ and PM_{2.5} were collected at selected sites in southeast Kansas from March 1999 to October 2000, using portable MiniVol particulate samplers. Selected PM_{2.5} samples were subjected to acid digestion and analyzed for 20 trace metals. The purpose was to assess the influence on air quality of four industrial facilities that burn hazardous waste in the area located in the communities of Coffeyville, Chanute, Independence and Fredonia. Both spatial and temporal variations were observed in the data for six metals of particular concern with respect to incineration emissions, beryllium (Be), chromium (Cr), arsenic (As), cadmium (Cd), barium (Ba) and lead (Pb). Data for these six metals were subjected to thorough statistical analysis. The results from these did not find sampling site to be a statistically significant factor for trace metal concentrations. The temporal factor was found to be significant for Cr, Ba and Pb. Sampling sites were located north and south of the four targeted sources to provide upwind and downwind samples; no statistically significant difference between upwind and downwind samples was found. Selected sample days were divided into four classifications: predominantly south winds (S), predominantly north winds (N), calm/variable winds (CV), and winds from other directions (O). The effect of wind direction was found to be statistically significant for Cr and Ba ($\alpha = 0.05$) and Pb ($\alpha = 0.1$). Calm/variable winds produced the highest Cr concentrations, predominantly north winds produced the highest Ba concentrations, and both predominantly south and calm/variable produced higher Pb concentrations. The significant effect of wind direction on Cr, Ba, and Pb suggest that regional sources may exert a large influence on the concentrations of these metals.