

Effects of Wind Direction on VOC Concentrations in Southeast Kansas

Paper # 470

Sergio A. Guerra, Dennis D. Lane, Glen A. Marotz, Ray E. Carter, Carrie M. Hohl

Department of Civil, Environmental, and Architectural Engineering, University of Kansas, 4112 Learned Hall, Lawrence, KS 66045

Richard W. Baldauf

U.S. Environmental Protection Agency, Office of Research and Development, National Vehicle and Fuel Emissions Lab, 109 T.W. Alexander Drive, Research Triangle Park, NC 27711

ABSTRACT

Twenty-four-hour whole-air samples were collected in evacuated stainless steel canisters and analyzed for volatile organic compounds (VOC) at selected sites in southeast Kansas from March 1999 to October 2000. The purpose was to assess the influence on air quality of four industrial facilities that burn hazardous waste located in the communities of Coffeyville, Chanute, Independence and Fredonia. Fifteen of the VOC analytes were found at concentrations above the detection limit and above levels observed in the blanks. Data were analyzed to investigate whether sampling site and date had a significant effect on VOC concentration. Results indicate that site and/or date were significant factors for many of the VOCs. To further investigate the temporal factor, sampling days were divided into four classifications based on wind direction: predominantly north winds, predominantly south winds, calm/variable winds and other winds. Results from statistical analyses show that wind direction was a significant factor for benzene, toluene, o-xylene, naphthalene, and carbon tetrachloride. Data from upwind and downwind samples were analyzed for the four cities of interest in the study area, to investigate the effect of the four targeted sources on VOC concentrations. Results from Fredonia showed higher concentrations of toluene, ethyl benzene, styrene, methyl chloride, and trichloroethylene in the upwind samples, although none of the results were statistically significant. Chanute also showed higher concentrations of the same compounds and m,p-xylene in the upwind samples; results were significant at the 0.05 level for toluene, ethylbenzene, and xylene. These results indicate that sources other than those targeted in the sampling network may be contributing to the VOC levels. Results from Independence showed higher concentrations of ethylbenzene and styrene in the downwind samples; results were statistically significant. These results indicate that the source targeted in the sampling network may be contributing to the VOC levels at those sampling sites.