The role of road transport and industrial emission sources in daily distribution of BTX concentrations in Wroclaw air

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The study of apportionment of BTX to various sources and its implicated control strategies is usually conducted using the chemical mass balance (CMB) receptor model, provided that their major sources have been clearly characterized (McLaren *et al.*, 1996; Watson *et al.*, 2001). For species commonly found in Wroclaw, such as BTX, their relative abundances in some cases were significantly different from the vehicular emissions, confirming the existence of non-vehicular emissions. In principle, the contribution of non-vehicular and vehicular sources can be determined even for area without complete source profiles if there exists time series of BTX concentrations which can exclusively serve as an indicator of vehicular emissions and a basis for identifying non-vehicular episodes.

Our approach to the data has been work with the basic hourly data of benzene, toluene and xylenes (m,p- and o-xylene) and other gaseous-phase pollutants (ozone , NOx, CO) measured over Wroclaw area during September 2006 to distinguished from the general body of data events which characterize the impact of different emission sources (e.g. for two identified episodes in September, 18/19 and September, 8). BTX concentrations showed diurnal variations with high concentrations in the morning and evening, and low concentrations during the daytime (Figure 1). The concentration rankings of the compounds closely associated with solvent usage such as toluene, m-/p-xylene, and o-xylene in the evening or night were higher than to those in the morning. The subset of BTX data in the morning period is composed of primary pollutants , and their concentrations probably most closely reflect local traffic emissions.

To identify the contribution of the probable sources of VOC emission, mass balance analysis was performed for four cases: (1) gasoline exhaust emissions - solvent usage derived emissions and the monthly mean (September) , (2) traffic related origin of pollutants from gas concentration measurements in ambient air – solvent usage emissions calculated from gas concentration measurements in ambient air and the monthly mean concentration, (3) traffic related origin of pollutants from measurements – solvent usage emissions calculated from measurements on 18 September and the daily mean, (4) traffic related origin of pollutants from measurements – solvent usage emissions calculated from measurements on 8 September and the daily mean. The results from the CMB analysis showed that road traffic dominates the BTX emissions in the city (Figure 2). The contribution was almost 100% for benzene and above 80% for toluene and xylenes when there were considered monthly means. Significant contributions from solvent emissions could only be observed during specific meteorological conditions, when the impact of solvent sources accounted on average for about 50% of measured toluene concentrations, and even above 90% of measured xylenes concentrations.

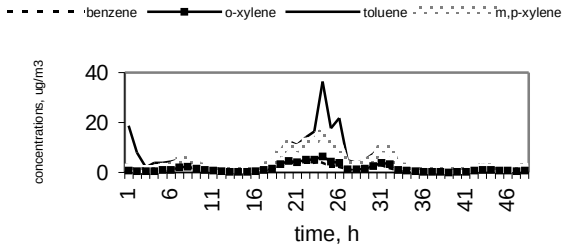

Figure 1. Diurnal variation of BTX concentrations in September, 18-19, 2006.

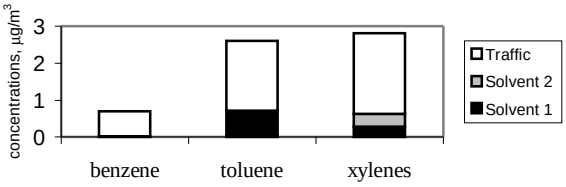

Figure 2. The monthly average mean of BTX concentrations and the concentrations calculated by the CMB model for traffic and solvent use emissions.

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