

The Spatial and Temporal Distribution of Ambient Benzene, Toluene, Ethylbenzene and Xylene Concentrations at an International Airport in South Africa

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Abstract : Airports are known air pollution hotspots due to the variety of fuel driven activities that take place within the confines of them. As such, people working within airports are particularly vulnerable to exposure of hazardous air pollutants, including hundreds of aromatic hydrocarbons, and more specifically a group of compounds known as BTEX (viz. benzene, toluene, ethyl-benzene and xylenes). These compounds have been identified as being harmful to human and environmental health. Through the use of passive and active sampling methods, the spatial and temporal variability of benzene, toluene, ethyl-benzene and xylene concentrations within the international airport was investigated. Two sampling campaigns were conducted. In order to quantify the temporal variability of concentrations within the airport, an active sampling strategy using the Synspec Spectras Gas Chromatography 955 instrument was used. Furthermore, a passive sampling campaign, using Radiello Passive Samplers was used to quantify the spatial variability of these compounds. In addition, meteorological factors are known to affect the dispersal and dilution of pollution. Thus a Davis Pro-Weather 2 station was utilised in order to measure in situ weather parameters (viz. wind speed, wind direction and temperature). Results indicated that toluene varied on a daily, temporal scale considerably more than other concentrations. Toluene further exhibited a strong correlation with regards to the meteorological parameters, inferring that toluene was affected by these parameters to a greater degree than the other pollutants. The passive sampling campaign revealed BTEXtotal concentrations ranged between 12.95 - 124.04 $\mu\text{g m}^{-3}$. From the results obtained it is clear that benzene, toluene, ethyl-benzene and xylene concentrations are heterogeneously spatially dispersed within the airport. Due to the slow wind speeds recorded over the passive sampling campaign (1.13 m s⁻¹), the hotspots were located close to the main concentration sources. The most significant hotspot was located over the main apron of the airport. It is recommended that further, extensive investigations into the seasonality of hazardous air pollutants at the airport is necessary in order for sound conclusions to be made about the temporal and spatial distribution of benzene, toluene, ethyl-benzene and xylene concentrations within the airport.

Keywords : airport, air pollution hotspot, BTEX concentrations, meteorology

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