

Polycyclic Aromatic Hydrocarbons, TSP and PM_{2.5} Concentrations Gradient Associated with Various Distances near a Heavily Trafficked Highway

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Abstract

This study attempts to identify ambient air quality gradients near a high traffic highway by measuring the concentration of PAHs, total suspended particles (TSP) and PM_{2.5} at three different distances (50m, 100m and 150m) from New Jersey Turnpike. Ambient air samples were collected for periods of 24 hours and every 6 days between September 2007 and September 2008. 16 PAHs along the gradient were also investigated for their concentration, phase distribution, seasonal and distance variation. The total PAH concentrations (gas + particle phases) was higher compared to more suburban sites less impacted by heavy traffic. Gas phase Σ PAH concentration along the gradient accounts for ~85% of the total atmospheric PAH's and ranged from 4.17 to 97 ng/m³, which is 5-6 times higher than particle phase. Σ PAH concentration was significantly correlated with TSP concentration, across the season. While the percent fraction contributions of Σ PAH to TSP mass were highest during the winter (0.05%, $r^2=0.47$, $p<0.05$), they were lowest in the summer (0.03%, $r^2=0.50$, $p<0.05$) due to the photochemical/chemical transformation of PAH. PM_{2.5} on the other hand did not show a significant difference with distance. This gradient was mainly attributed to the emissions from diesel engine exhausts since a significant correlation was found between the number of diesel vehicle and concentrations of Σ PAH. Weekday concentrations of TSP and PAHs were consistently higher than the weekends. This weekday effect was not observed for PM_{2.5}. Two season intensive sampling results shows PM_{2.5} and PAHs concentrations were increased with humidity and temperature, but decreased with precipitation and higher wind speed condition.

Keywords: PAH, Traffic, Particulate Matter