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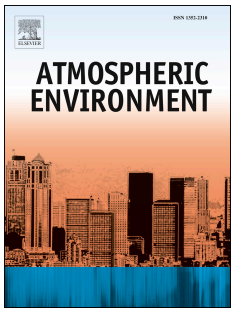

Does urban forestry have a quantitative effect on ambient air quality in an urban environment?

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Key Words: PM_{10}, $PM_{2.5}$, vehicular traffic, air pollution, particulate matter, urban vegetation

Abstract

Increasing urban greenspace has been proposed as a means of reducing airborne pollutant concentrations; however limited studies provide experimental data, as opposed to model estimates, of its ability to do so. The current project examined whether higher concentrations of urban forestry might be associated with quantifiable effects on ambient air pollutant levels, whilst accounting for the predominant source of localized spatial variations in pollutant concentrations, namely vehicular traffic. Monthly air samples for one year were taken from eleven sites in central Sydney, Australia. The sample sites exhibited a range of different traffic density, population usage, and greenspace / urban forest density conditions. Carbon dioxide (CO_2), carbon monoxide (CO), total volatile organic compounds (TVOCs), nitric oxide (NO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), total suspended particulate matter (TSP), suspended particles <10 μm in diameter (PM_{10}) and particulate matter <2.5 μm ($PM_{2.5}$), were recorded, using portable devices. It was found that air samples taken from sites with less greenspace frequently had high concentrations of all fractions of aerosolized particulates than other sites, whilst sites with high proximal greenspace had lower particulates, even when vehicular traffic was taken into account. No observable trends in concentrations of NO, TVOC and SO_2 were observed, as recorded levels were generally very low across all sampled areas. The findings indicate, first, that within the urban areas of a city, localized differences in air pollutant loads occur. Secondly, we conclude that urban areas with proportionally higher concentrations of urban forestry may experience better air quality with regards to reduced ambient particulate matter; however conclusions about other air pollutants are yet to be elucidated.

1. Introduction

Air pollution is ubiquitous in industrialised and densely populated regions (Begg et al., 2007). Most urban air pollution comes from road traffic, and is comprised of a mixture of airborne particulate matter (PM), oxides of sulfur (SOx), oxides of nitrogen (NOx), carbon monoxide (CO), carbon dioxide (CO_2), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), and ozone (Thurston, 2008). Outdoor air pollution kills approximately 8 million people across the world every year (WHO, 2014), with a global cost of