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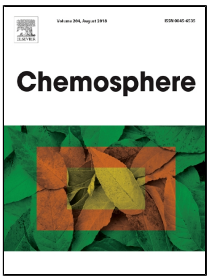

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Wetlands with greater degree of urbanization improve PM2.5 removal efficiency

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Abstract
In recent decades, China has experienced both rapid urbanization and heavy air pollution and the rapid urbanization trend would be continue in the next decade. Wetlands have been shown to be efficient in particle removal, primarily through dry deposition and leaf accumulation. Thus, a more comprehensive understanding of PM2.5 removal by wetlands during urbanization processes could inform urban planning. In the current study, three wetland plots, Cuihu Lake Park (CL), Summer Palace (SP), and Olympic Park (OP), were selected as low, medium, and highly degrees of urbanization site respectively based on the proportions of building and traffic district areas to compare the removal efficiencies. Results show the average dry deposition velocity in OP was significantly higher than CL and SP. Dry deposition is mainly influenced by meteorological conditions. Buildings and other infrastructure make the meteorological conditions conducive to deposition, resulting in higher wind velocity, higher temperature, and more intense turbulence between buildings. Variation in leaf accumulation was not statistically significant between the three plots, and plant species was the major factor affecting the amount of accumulation. The dry deposition contribution to particle removal increases with degree of urbanization. The average dry deposition accounted for 39.74%, 52.55%, and 62.75% at low, middle and high level respectively. Therefore, Wetlands with greater degree of urbanization improve PM2.5 removal efficiency primarily by accelerating the dry deposition process. The result emphasizes the importance of wetlands in particle removal in highly urbanized areas and thus more wetlands should be preserved and/or created during urban expansion.

Keywords: urbanization; PM2.5; wetlands; dry deposition; leaf accumulation

1. Introduction

The 2016 Habitat III conference of cities predicted that the world's urbanized area would double by 2050 and contain 80% of the population (Li et al., 2017). Despite the conveniences offered by cities, urbanization also includes issues such as the urban heat island (UHI) effect and atmospheric pollution (Zhou et al., 2014; Hao and Liu, 2016; Cheng et al., 2017). China has experienced both rapid urbanization and heavy air pollution in recent decades (Zhang et al., 2012; Ma et al., 2016; Zhang and Su, 2016). From 1978 to 2012, the total urban land area expanded from 7,438 to 45,566 km^2 (Chen et al., 2016), and the total urban population was predicted to be 1 billion in 2050 (Vogel et al., 2010). China has the highest urban expansion rate in the world (Seto et al., 2011). Rapid urbanization relies on a robust economic growth (Bai et al., 2011), and this is particularly true in China because a large proportion of the annual