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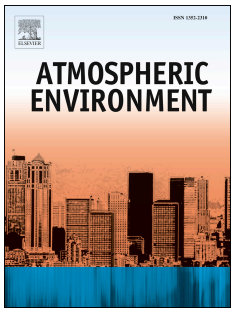

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Observations of particle extinction, $PM_{2.5}$ mass concentration profile and flux in north China based on mobile lidar technique

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HIGHLIGHTS

Characteristics of the vertical distribution of fine particles in Beijing were observed.

Transport fluxes of Beijing were estimated based on a vehicle-based mobile lidar.

Southwest was an important regional transport pathway of Beijing.

Abstract

Fine particle with diameter <2.5 μm ($PM_{2.5}$) have important direct and indirect effects on human life and activities. However, the studies of fine particle were limited by the lack of monitoring data obtained with multiple fixed site sampling strategies. Mobile monitoring has provided a means for broad measurement of fine particles. In this research, the potential use of mobile lidar to map the distribution and transport of fine particles was discussed. The spatial and temporal distributions of particle extinction, $PM_{2.5}$ mass concentration and regional transport flux of fine particle in the planetary boundary layer were investigated with the use of vehicle-based mobile lidar and wind field data from north China. Case studies under different pollution levels in Beijing were presented to evaluate the contribution of regional transport. A vehicle-based mobile lidar system was used to obtain the spatial and temporal distributions of particle extinction in the measurement route. Fixed point lidar and a particulate matter sampler were operated next to each other at the University of Chinese Academy of Science (UCAS) in Beijing to determine the relationship between the particle extinction coefficient and $PM_{2.5}$ mass concentration. The correlation coefficient (R^2) between the particle extinction coefficient and $PM_{2.5}$ mass concentration was found to be over 0.8 when relative humidity (RH) was less than 90%. A mesoscale meteorological model, the Weather Research and Forecasting (WRF) model, was used

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