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# Atmosphere boundary layer height and its effect on air pollutants in Beijing during winter heavy pollution

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## Abstract

Beijing is suffering from serious particulate matter pollution, and the atmosphere boundary layer (ABL) has important direct and indirect effects on human activities. This research analyzed the characteristics of the ABL in Beijing and discussed the impacts of meteorological factors on atmosphere boundary layer height (ABLH) during winter heavy pollution events in Beijing. The data observed by Mie lidar in the winter of 2014 to 2016 were used to estimate the ABLH by employing image edge detection. In addition, a weather research and forecasting (WRF) model was used to simulate the meteorological field in the same period. Ground and vertical data indicated that the average ABLH decreased from 0.63 km to 0.53 km in three consecutive years. In addition, a significant negative correlation existed between ABLH and $PM_{2.5}$, and the effect of low ABLH on the vertical diffusion capacity of pollutants was greater than that of high ABLH. Relative humidity was negatively correlated with ABLH, increasing during the three years at a rate of 61%. In the winter of 2014, the atmosphere was dominated by instability, which was beneficial to the development of ABL. In contrast, many stable stratifications occurred in the upper air during the winters of 2015 and 2016; however, these were not conducive to