Geophysical Research Abstracts
Vol. 21, EGU2019-5604, 2019
EGU General Assembly 2019

Contributions of Meteorological Conditions to the Wintertime PM2.5 over Beijing City

Wei Yu (1,2,3), Renhe Zhang (1), and Xiaoyan Wang (1)

(1) Institute of Atmospheric Sciences, Department of Atmospheric and Oceanic Sciences, Fudan University, Shanghai, China (wyu16@fudan.edu.cn), (2) Shanghai Institute of Meteorological Science, Shanghai Meteorological Service, Shanghai, China(wyu16@fudan.edu.cn), (3) Shanghai Key Laboratory of Meteorology and Health, Shanghai, China(wyu16@fudan.edu.cn)

With rapid urbanization and industrialization in China, the frequency of wintertime severe haze events has increased dramatically over the past decades in Beijing. PM2.5 (particulate matters with diameter less than 2.5 μm) pollution has become a serious environmental problem due to its adverse human health and economic impacts. Meteorological conditions play an important role in the PM2.5 concentration evolution. But it is still unclear how dynamic and thermodynamic meteorological factors affect PM2.5 mass concentration, which is critical to understand variability of air quality and its future projections. In this investigation, the hourly PM2.5 concentration and meteorological reanalysis dataset were used to quantify the contribution of meteorological conditions to the PM2.5 concentration variation. Results show that the dynamic meteorological factors, including wind velocities, vertical shear of horizontal winds in the middle and lower troposphere, can affect PM2.5 mass concentration. Thermodynamic factors effecting air quality include stratification instability in middle and lower troposphere, the dew-point deficit and the inversion in near-surface. The larger (smaller) the stratification instability and the inversion are, the higher (lower) the PM2.5 mass concentration is. The smaller (larger) the dew-point deficit is, the higher (lower) the PM2.5 mass concentration is. The effects of boundary layer height and sea level pressure on the PM2.5 evolution are also discussed in this study. Based on the above meteorological factors, a multiple linear regression model is established. By using this model, we found that the contributions of dynamic and thermodynamic factors to the PM2.5 evolution are comparable. The combined contribution of dynamic and thermodynamic meteorological factors to the PM2.5 variability reaches 0.39.