1.159 Chemical composition and source apportionment of PM2.5 in Beijing based on daily samples collected in 2012-2014.

Early Career Scientist

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Abstract:

Beijing, the capital of China, has been experiencing serious air pollution over the last decade. A variety of governmental policies have been implemented to improve the air quality, however, the concentration of $PM_{2.5}$ remains high. Understanding the sources of $PM_{2.5}$ is of essential importance for air quality management. From 2012 to 2014, daily $PM_{2.5}$ samples were collected in an urban site for 24 months in Beijing, China. The major chemical components of $PM_{2.5}$ analyzed include water-soluble ions, organic carbon (OC), element carbon (EC), and trace elements. Seven main components were identified, including sulfate, nitrate, ammonium, minerals, trace element oxidizes (TEOs), organic matters (OM) and EC, and the average concentration were 11.7 (0.1-39.7), 13.2 (0.2-95.8), 6.7 (0.1-39.8), 11.9 (0.4-227.0), 3.6 (0.1-26.7), 23.5 (2.4-106.0), 1.7 (0.1-8.9) $\mu g\ m^{-3}$, respectively. Distinct seasonal variations were clearly seen. The positive matrix factorization (PMF) model was applied for the source apportionment of $PM_{2.5.}$ Six $PM_{2.5}$ source categories were identified. The major contributors of $PM_{2.5}$ were secondary inorganic aerosol, followed by coal combustion, biomass burning, vehicle emissions, minerals, smelting industry. Seasonal variations of the contribution of each sources were shown. Minerals contributed more in spring than in other seasons in 2012, but not in spring in 2014, which may mainly due to the changes in wind speed and direction. The contributions from coal combustion and biomass burning were higher in heating seasons than in non-heating seasons, The major reasons for this seasonal variation could be straw burnings for cropland cleaning as well as wood burnings and coal combustion for heating. The contribution from secondary inorganic aerosol was the largest and did not show that obvious seasonal variations compared to other sources. This may be caused by the higher emissions of NO_2 and SO_2 in winter and the strong photochemical reaction in summer.