

1.014 Impacts of meteorological factor and aerosol chemical compositions on visibility impairment in Nanjing, China.

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Abstract:

With rapid industrialization and urbanization, air pollution and corresponding visibility problems in Nanjing were increasingly severe during the last few years. To better understand the potential causes of impaired visibility, particulate matter mass and chemical composition were measured from May 2013 to May 2014 in Nanjing. During the period, major water soluble ions and organic carbon exhibited obvious seasonal variations with the highest level in winter. The daily average visibility in Nanjing over study period ranged from 1.2 km to 18.4 km. High aerosol concentration and relative humidity were two important factors that cause low visibility events in Nanjing. The correlation between $PM_{2.5}$ concentration and visibility under different relative humidity values showed that visibility was exponentially decreased with the increased $PM_{2.5}$ concentrations when relative humidity less than 80%. However, the relationship was no longer to follow the exponentially decreasing trend when relative humidity > 80%, and the visibility maintained in very low values, even with low $PM_{2.5}$ concentrations. This indicated the hygroscopic growth of particles played more important roles for reduction of visibility. The annual average chemical extinction coefficient based on the revised IMPROVE equation was $267.69 \pm 139.24 \text{ Mm}^{-1}$ in Nanjing. On average, organic matter was found to be the largest contributor accounting for 35.69% of chemical extinction coefficient. The contributions of ammonium sulfate and ammonium nitrate were also important with the annual average of 28.80% and 24.08%, respectively. For visibility > 10 km, organic matter was the largest contributor to extinction coefficient, while organic matter and ammonium sulfate were the main contributors for visibility < 5 km. The reduction of carbonaceous species and sulfate could effectively improve the visibility of Nanjing. The paper aims to help environmental scientists and policy makers understand air pollution in Nanjing and air pollution control strategies taken by government.