



Effect of aerosols on visibility and radiation in Tianjin, China

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Meteorological and aerosol data were measured at the atmospheric boundary layer observation station in Tianjin, China, and were analyzed to study the effects of aerosol mass, composition, and size distributions on visibility and short-term radiation flux. The results show that fine particles played important roles in controlling visibility in Tianjin. The major contributors to light extinction coefficients included sulfate (28.7%), particulate organic matter (27.6%), elemental carbon (19.2%), and nitrate (6.1%). In addition to the measurement of aerosol composition, the size distribution of aerosol number concentrations were also measured and classified between haze days and non-haze days during spring. The extinction characteristics of ambient aerosol in haze days and non-haze days were calculated using Mie theory model. The average extinction coefficient and scattering coefficient of atmospheric aerosols were 0.253 km^{-1} and 0.213 km^{-1} in non-haze days, while 0.767 km^{-1} and 0.665 km^{-1} in haze days. A radiation transmission model LOWTRAN7 is also applied in this study. The model calculated radiant flux densities in haze days and non-haze days, which showed a fairly agreement with the observation results, showing that the heavy aerosol loadings in Tianjin had significantly impact on atmospheric visibility and radiation fluxes.