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Characterization of Black and Brown Carbon Concentrations and Sources during winter in Beijing

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Carbonaceous aerosols, including black carbon (BC) and organic carbon (OC), play important roles in air quality, human health, and climate change. A better understanding of sources of light-absorbing carbonaceous aerosol (including black carbon and brown carbon) is particular critical for formulating emission-based control strategies and reducing uncertainties in current aerosol radiative forcing estimates.

Beijing, the capital of China, has experienced serious air pollution problems and high concentrations of carbonaceous aerosols in recent years, especially during heating seasons. During November and December of 2016, several severe haze episodes occurred in Beijing, with hourly average PM2.5 mass concentration up to 400 μg/m3. In this study, concentration levels and sources of black carbon and brown carbon were investigated based on 7-wavelength Aethalometer (AE-33) with combination of other PM2.5 chemical composition information. Contributions of traffic and non-traffic emissions (e.g., coal combustion, biomass burning) were apportioned, and brown carbon was separated from black carbon. Our preliminary results showed that (1) Concentrations of BC were around 5.3$\pm$4.2 μg/m3 during the study period, with distinct diurnal variations during haze and non-haze days. (2) Traffic emissions contributed to about 37$\pm$17% of total BC, and exhibited higher contributions during non-haze days compared to haze days. (3) Coal combustion was a major source of black carbon and brown carbon in Beijing, which was more significant compared to biomass burning. Sources and the relative contributions to black carbon and brown carbon during haze and non-haze days will be further discussed.

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