5.152 Source Apportionment of Light-absorbing Carbonaceous Aerosol in Beijing.

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Abstract:

Carbonaceous aerosol, including black carbon (BC) and organic aerosol (OA), plays an important role in air quality, health impact, and climate change. BC has been recognized as the strongest light-absorbing component of aerosol and ranks as the second-largest human contributor to climate change. OA has also drawn increasing attention recently as some OA has been found to be light-absorbing (defined as brown carbon, BrC). The study of brown carbon is particular critical in reducing uncertainty of aerosol radiative forcing estimate.

Beijing, the capital of China, has experienced serious air pollution problems in recent years, which is also known as haze. Abundant light-absorbing carbonaceous aerosol has been found in Beijing, especially during the heating season and haze periods. A better understanding of sources of light-absorbing carbonaceous aerosol is essential for formulating emission-based control strategies and constraining uncertainties in current aerosol radiative forcing estimates. In this study, source apportionment of BC has been conducted using the wavelength-dependent and high time-resolution aethalometer data (AE-33) during winter of 2015. Traffic and non-traffic source contribution to BC has been identified and quantified. Sources of brown carbon during winter in Beijing are also determined by dual carbon isotope (^{14}C and ^{13}C) techniques. Our results show that non-traffic source contributes to 60-80% of total BC during haze episodes, while traffic-derived BC dominates in clean days and could account for 50% of total BC in urban Beijing. Higher light absorptivity of BrC has been found in polluted days compared to clean days. With isotopic signatures, fossil source has been identified as the major source of brown carbon in winter of Beijing, especially those from coal combustion.