Contribution and sources of light absorption brown carbon at a suburban site in Guangzhou, China

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ABSTRACT:
Light-absorbing organic carbon (brown carbon, BrC) aerosols have recently received much attention because of their potential roles in global radiative forcing. While there are a number of studies on the optical and chemical compositions of aerosols independently, relationship between the absorption and chemical characteristics of aerosols was much less constrained in field studies. Here, we present real time aerosol light absorption and chemical composition measurements at Panyu, downwind of Guangzhou from November to December 2014. Aerosol absorption were measured using a 7-wavelength Aethalometer model AE33, while chemical properties were measured by a high resolution time-of-flight aerosol mass spectrometer (HR-ToF-AMS). The average aerosol light absorption was 11.8 Mm⁻¹ at 370nm, 8.6 Mm⁻¹ at 470 nm, 7.3 Mm⁻¹ at 520, 6.3 Mm⁻¹ at 590nm, 5.6 Mm⁻¹ at 660nm, 3.8 Mm⁻¹ at 880nm and 3.6 Mm⁻¹ at 950nm. The Absorption Angstrom Exponent (AAE) method was used to attribute light absorption by BrC. Our results found that light absorption due to BrC contributed 21.1% of the total aerosol absorption at 370nm, 15.2% at 470nm, 9.6% at 520 nm, 7.4% at 590nm and 7.2% at 660 nm. The BrC absorption were associated with biomass burning related organic aerosol (BBOA) and low-volatile oxygenated organic aerosol (LVOOA) at this site. Furthermore, fragments from aerosol mass spectrometry revealed that CₓHᵧN, CₓHᵧO[subscript]zN and CₓHᵧON, which are possible from the N-Heterocyclic compounds, were likely to be responsible for the observed optical properties of BrC.

KEYWORDS: brown carbon, biomass burning related organic aerosol, low-volatile oxygenated organic aerosol, Pearl River Delta

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