



## **Brown carbon aerosol in urban Beijing during winter: the light absorption properties, source contributions and radiative effect**

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Brown carbon (BrC, also named light-absorbing organic compounds) in the atmospheric aerosol has significant contribution to light absorption and radiative forcing. The light absorption contribution of BrC to carbonaceous aerosol at short wavelength have been observed in biomass burning aerosol and ambient aerosol in recent years (Lack et al., 2012; Laskin et al., 2015). BrC from other emissions sources, e.g., coal combustion and vehicle emissions, are not well known. In this study, light absorption properties of BrC from biomass burning, coal combustion and vehicle exhaust were investigated and compared to that from ambient aerosol. The source-specific mass absorption efficiency (MAE) exhibited large difference with descending orders of biomass burning > coal combustion > vehicle exhaust. Using the source-specific MAE values, the BrC sources in Beijing were investigated. The average contributions of these sources to BrC absorption in 330–450 nm are 71% of coal combustion, 14% of biomass burning, 10% of secondary formation, and 5% of traffic emissions, respectively. The particulate BrC absorptions obtained by Mie calculation from BrC extracts could contribute ~40% of the total ultraviolet absorption of solar radiation (300–400 nm) by carbonaceous aerosol. Further, the light absorption of BrC leads to ~15% offset of the negative radiative forcing compared to results when assuming organic aerosol is non-absorbing material.

### Reference:

Lack, D.A., Langridge, J.M., Bahreini, R., Cappa, C.D., Middlebrook, A.M., Schwarz, J.P.: Brown carbon and internal mixing in biomass burning particles, *Proc. Natl. Acad. Sci. U. S. A.*, 109, 14802–14807, 2012.  
Laskin, A.; Laskin, J.; Nizkorodov, S. A.: Chemistry of atmospheric brown carbon, *Chem. Rev.*, 115, 4335–4382, 2015.