

Sources of Carbonaceous Aerosol in Beijing Based on Carbon Isotopes and Emission Inventory

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Carbonaceous aerosol, including organic aerosol (OA) and black carbon (BC), constitutes a substantial fraction of atmospheric fine particulate matter, and plays a critical role in air quality and aerosol radiative forcing. China, with abundant anthropogenic emissions, is experiencing serious air pollution problems in recent years. Carbonaceous aerosol can account for about one third of fine particulate matter mass concentration in most cities in China. It is very important to study sources of carbonaceous aerosol in China, especially in Beijing, the capital city, where frequent haze episodes occur. Radiocarbon (¹⁴C) analysis is a powerful technique and provides quantitative information to differentiate contributions from biomass/biogenic and fossil fuel source while stable carbon isotopes (¹³C) could provide additional information regarding sources. In this study, relative contributions of fossil and biomass/biogenic sources to OA and BC are determined and compared based on the source apportionment results from ¹⁴C methods and emission inventory, and the reasons for such difference are discussed. In addition, major sources of OA and BC are investigated with ¹³C fingerprints and emission inventory by sectors. Isotopic results of carbonaceous aerosol from Beijing and other cities in China are compared, including Shanghai and Guangzhou, and characteristics of carbonaceous aerosol in each city and their major sources are identified.

Keywords: Carbonaceous Aerosol, Isotope, Source, Megacity, China

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