

Fossil and non-fossil sources of carbonaceous aerosols during the winter at five background sites in China

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Carbonaceous aerosol (Total carbon, TC) was source apportioned at five background sites in China during winter of 2019/2020 by a combination of measurements of radiocarbon (¹⁴C), organic carbon (OC), elemental carbon (EC) and organic tracers. The five sites are Longfengshan (LFS), Shangdianzi (SDZ), Waliguan (WLG), Jinsha (JS), and LinAn (LA), located in the northeast area, Beijing-Tianjin-Hebei region, Qinghai-Tibet Plateau, and the middle and lower reaches of the Yangtze River in China, respectively, to represent different regions of China. The non-fossil emissions accounted for 69, 44, 61, 69 and 50 % of TC for LFS, SDZ, WLG, JS and LA, respectively. It clearly demonstrated the abundance of carbonaceous aerosols originating from contemporary sources. Our study shows that in the economically developed Beijing-Tianjin-Hebei region and the Yangtze River Delta, the contribution of fossil sources to carbonaceous aerosols were the most prominent. Wood and agricultural residues burned for heating contributed to considerable non-fossil carbonaceous aerosols to Northeast China. Coal combustion was the main source of EC in Central China, and the higher F¹⁴C value of TC was mainly from the secondary organic carbon (SOC) emitted by natural sources. High OC / EC ratios and low carbonaceous species levels in the Tibetan Plateau may have resulted from secondary processes and less anthropogenic emissions. In all regions, the largest contributor to TC was SOC, which means this fraction was important in regional atmospheric carbonaceous aerosols in China, indicating the presence of a regional background of SOC in China.