



Stable carbon isotope composition and source indication in two consecutive winters at 7 sites along the Western Taiwan Strait region

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The Western Taiwan Strait region, or the Urban Agglomerations on the West Side of the Straits, including about 20 cities in Fujian Province, Zhejiang Province, and Guangdong Province, is a new special developing economy city cluster in southeast coast of China. The Western Taiwan Strait region was influenced by the east Asia monsoon greatly, and provided an active environment for the interactions between the continent and the ocean. With the rapid economic development, air pollution has become a severe public affair and drawn extensive attention. In order to understand the regional level and source contributions of PM_{2.5} pollution in the Western Taiwan Strait region, filter samples were collected in seven sites in this region, including four urban sites (Fuzhou, Xiamen, Ningde, and Longyan), one suburban site (Ningbo), one remote site (Pingtan), and one mountain site (Mt. Wuyi) in two consecutive winters, using the Four-Channel samplers and the High-Volume samplers simultaneously. Quartz filters were used to analyse the carbonaceous components (element carbon and organic carbon), POM (Particulate Organic Matters) and the stable carbon isotope. Substantial secondary organic formation has happened during the sampling periods. Significant regional pollution episodes were observed in each winter at the all seven sites. To investigate the source origins and variations during the pollution episodes, as well as the transport paths along the coastline, stable carbon isotope analysis was conducted, respectively. Between the two major kinds of fossil sources, the contribution of vehicle emission was much higher than coal combustion. The major anthropogenic source in the urban sites and the suburban site was vehicle emissions, while the biogenic source contributed more to the remote site and the mountain site. C₃ plant was the dominant biogenic source. The biogenic source contribution proportions could increase in some specific pollution periods, with the impact of both source emissions and various meteorological conditions. In winter 2016, it showed a local pollution pattern with diverse $\delta^{13}\text{C}$ ratios distribution. In winter 2017, regional pollution happened in The Western Taiwan Strait region, according to the conjunct $\delta^{13}\text{C}$ ratios variation trend at the 7 sites.