Seasonal variation of airborne particles characteristics and sources in Beijing during 2010/2011

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Keywords: haze, seasonal variation, source apportionment, PMF, back trajectory cluster analyses.
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A lot of emission reduction measures to improve the air quality in Beijing were performed during the Olympic Summer Games in 2008, which has cut down coarse particles largely. But high air pollution has become more frequent (Du et al., 2014; Gao et al., 2014).

In order to find out the long-term characteristics of airborne PM in different seasons, a continuous one-year daily mean PM sampling from June 2010 till June 2011 was performed on the ground at the campus of the China University of Geosciences, Beijing (CUGB). To discriminate the composition of $PM_{2.5}$ source attribution, particle characteristics and external impacts on the PM levels were investigated. Two sequential High-Volume Samplers (Digitel DHA-80, Hegnau, Switzerland) were operated to collect PM_4 samples.

The inorganic elements, inorganic water-soluble ions, EC and OC as well as Levoglucosan, eleven hopane substances and eleven PAHs of PM were analysed from PM samples by PEDXRF, ICP-MS, IC, thermal/optical carbon analyser and in situ derivatisation direct thermal desorption gas chromatography time-of-flight mass spectrometry (IDTD-GC-TOFMS), respectively. Positive matrix factorization (version 3.0, U.S. EPA) on the basis of the chemical composition analyses and back trajectory cluster analyses were combined together to perform source apportionment. The results show that the main sources of particles during haze are different from season to season (Figure 1): secondary inorganic ions formation and biomass burning for summer and autumn haze, coal combustion for winter haze and mineral dust emissions for spring haze. Sources of PM during clear days were dominated by mineral dust emissions and traffic while haze was characterized by secondary inorganic ions formation during the whole year. High air pollution was found to be always accompanied by southerly air flows (industry and cities are about 100 km away), high relative humidity, low mixing layer height and low wind speed, i.e. stagnant weather conditions (Liu et al., 2014).

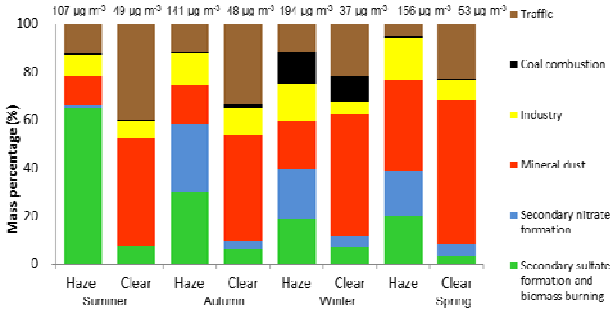

Figure 1: Mass contribution of different sources to PM_4 during haze and clear days in different seasons.

This work was supported by scholarships of the China Scholarship Council and the KIT Centre for Climate and Environment. Thanks to Prof. Kuang Cen, CUGB, for offering the sampling place and logistic support, MSc. Jing Wang and MSc. Jianying Wang, CUMTB, for assisting with collecting PM samples and MSc. Regula Muther, Digitel, for cooperation during QA/QC work.

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