Geophysical Research Abstracts
Vol. 18, EGU2016-10682, 2016
EGU General Assembly 2016

Advanced source apportionment of PM2.5 using online mass spectrometry in two major cities in China

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During winter 2013-2014 aerosol mass spectrometer (AMS) measurements were conducted in two major cities of China: Xi'an and Beijing. The AMS was equipped with a recently developed aerodynamic lens for direct measurements of the PM2.5 fraction for the first time in Asia (Williams et al., 2013). We could show that around 40% of the mass is lost using a conventional PM1 inlet. The statistical tool multi-linear engine 2 using constrained positive matrix factorization was used to derive the sources of organic aerosols. During the more extreme haze periods, 537 and 243 ug/m3 were recorded in Xi'an and Beijing respectively. The main results include a dominance of coal combustion in Beijing of the primary organic aerosols with a contribution of more than 90% to the cancerogenic polycyclic hydrocarbons. In Xi'an primary wood burning was a more important source. In both cities, an increase of secondary organic aerosols could be observed. The results including uncertainties will be discussed and put in perspective of previous analyses of haze in northern China including our previous analysis published in Nature (Huang et al., 2014). The study can be used as a role model for future similar analyses in Asia where the emission sources are highly complex.

Huang, R.J., Cao, J.J., El Haddad, I. and Prévôt A.S.H. et al. (2014) Nature 514, 218–222.
Williams, L.R., Prévôt, A.S.H., Worsnop, D.R. et al. (2013) Atmos. Meas. Tech. 6, 3271-3280.