Geophysical Research Abstracts
Vol. 20, EGU2018-5093, 2018
EGU General Assembly 2018

The Air Pollution and Human Heath in a Chinese Megacity research program: some early results

James Lee
Univeristy of York, National Centre for Atmospheric Science, Chemistry, York, United Kingdom (james.lee@york.ac.uk)

In China, air pollution is a severe problem with occurrence of haze increasing in severity and frequency between the 1950s and 2000s. Chinese cities face high particulate matter concentrations, in particular PM2.5 concentrations, which regularly exceed World Health Organisation (WHO) air quality guidelines. This has been linked to higher health risks to the cardiovascular system, cerebrovascular system and an increase in the probability of cancer and premature death.

Atmospheric Pollution and Human Health in a Chinese Megacity is a strategic research programme jointly supported by the UK's Natural Environment Research Council and Medical Research Council, and the National Natural Science Foundation of China. Its aims are to identify the concentrations and sources of urban air pollution in Beijing, identify how people are exposed, to understand how it affects their health and to determine what can be done about it. The research is largely based around measurement campaigns that took place in Beijing in winter 2016 and summer 2017.

During summer, elevated levels of ozone were regularly observed, with maximum concentrations of 180 ppbv. On $\sim$75% of days during this period, ozone breached the recommended WHO 8 hour exposure limit of 60 ppbv. The highest levels of ozone were observed on days when CO, volatile organic compounds (VOCs) and SO_2 concentrations were highest, showing the importance of industrial emissions of precursor VOCs for ozone formation. The importance of different VOCs for in-situ ozone formation is investigated using a simple steady state analysis of OH reactivity, along with a more detailed analysis using the Master Chemical Mechanism.

The mean daily concentration of PM2.5 in Beijing was 92.0 μg/m3 and 31.2 μg/m3 for winter and summer campaigns respectively. The concentration of organic and elemental carbon measured during the winter campaign was 22.3 and 3.4 μg/m3 respectively. It was found that secondary inorganic aerosols and soil dust accounted for 32.6% and 9.7% of fine particles at IAP. High contributions of potassium and chloride which represented 4.8% of PM2.5 mass, suggested a large contribution of coal/biomass burning during winter.

In order to understand emissions of primary air pollutants and improve emissions inventories, fluxes of a large range of pollutants (CO_2, CO, NO_x, ozone, VOCs and NH3) were measured. In addition, aerosol fluxes were measured using an Aerosol Mass Spectrometer (non-refractory NH4+, NO_3-, SO42-, Cl- and organic aerosol) and trialling a single particle soot spectrometer for black carbon. Fluxes were similar in magnitude to Western city centre locations, but with important differences: (a) aerosol emissions included SO_2- and Cl- not previously observed; (b) NH3 fluxes were larger than estimated for UK cities; (c) NO_x fluxes were lower than predicted by the emission inventories.

In addition, the exposure of Beijing inhabitants to key health related pollutants was studied using personal air pollution monitors and the associated between air pollution exposure and key cardiopulmonary measures was assessed. The contribution of specific activities, environments and pollution sources to the personal exposure of the Beijing population to air pollutants derived from outdoor sources was also studied.