Geophysical Research Abstracts
Vol. 21, EGU2019-17778, 2019
EGU General Assembly 2019

Concentrations and fluxes of black carbon in Beijing using single particle soot photometry measurements

Rutambhara Joshi (1), Dantong Liu (1), James Allan (1), Hugh Coe (1), Michael Flynn (1), Ben Langford (2), Eiko Nemitz (2), Neil Mullinger (2), Freya Squires (3), James Lee (3), Adam Vaughan (3), Yele Sun (4), Pingqing Fu (4), and Simone Kotthaus (5)

(1) University of Manchester, School of Earth and Environmental Science, Manchester, United Kingdom (rutambhara.joshi@postgrad.manchester.ac.uk), (2) Centre for Ecology and Hydrology, Edinburgh, United Kingdom, (3) Department of Chemistry, University of York, York, United Kingdom, (4) Institute of Atmospheric Science, Chinese Academy of Sciences, Beijing, China, (5) Department of Meteorology, University of Reading, Reading, United Kingdom

Black carbon (BC) forms an important component of particulate matter globally, due to its impact on the climate, environment and human health. Megacities such as Beijing are hotspots of BC emissions and due to rapid urbanisation and development their sources are uncertain and rapidly changing. Therefore, identifying and quantifying these emission sources is critical for effective policy making and achieving the desired reduction in air pollution.
In this study, at an urban location in Beijing, we present the first ever direct measurements of BC fluxes using eddy correlation. The measurements were made as part of a large joint UK-China field experiment, during winter 2016 (November-December) and summer 2017 (May-June).
We focus on characterising BC properties, particularly its mixing state, through analysis of the size and coating content of individual particles. This allows us to attribute individual particles to potential sources. We then use eddy correlation to separately calculate BC fluxes for each of the different sources. The Single Particle Soot Photometer (SP2) was used to uniquely quantify the morphology independent mass of single refractory BC particles and their coating content. Black carbon was measured at 5 Hz from an inlet placed at 102 m height, adjacent to a 3D sonic anemometer. From the covariance between concentrations and vertical wind speed emission fluxes can be calculated over flux footprints of several square kilometres, using the eddy covariance method.
In this paper, BC characterisation and flux analysis will be presented for both winter and summer seasons using four weeks of continuous data, which includes several severe haze pollution events. The analysis identified different habits of BC containing particles in summer and winter, which indicates a variation in their source origin (traffic, coal and biomass burning). The fluxes will provide further insight into complex environment of Beijing, allowing us to identify and quantify contribution of local emission sources. Furthermore, we have recently carried out similar flux emission studies in Delhi during Nov 2018. Initial data from this experiment will be presented, along with a preliminary comparison analysis of the emission trends in both megacities.