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The impact of boundary layer height on air pollution concentrations in London – early results from the ClearfLo project

S.I. Bohnenstengel (1), S.E. Belcher (1,7), J Barlow (1), O Coceal (1), CH Halios (1), J McConnell (1), H Lean (2), ZL Fleming (3), L Williams (4), C Helfter (5), and J Lee (6)

(1) Department of Meteorology, University of Reading, UK, (2) Met Office Joint Centre for Mesoscale Meteorology (JCMM), UK, (3) National Centre for Atmospheric Science (NCAS), Department of Chemistry, University of Leicester, UK, (4) Aerodyne Research, Inc., Billerica, MA, USA, (5) Centre for Ecology & Hydrology (CEH), UK, (6) National Centre for Atmospheric Science, Department of Chemistry, University of York, UK, (7) Met Office Hadley Centre, Exeter, UK

The ClearfLo projects aims to understand the processes generating pollutants like ozone, NO_x and particulate matter and their interaction with the urban atmospheric boundary layer. ClearfLo (www.clearflo.ac.uk) is a large multi-institution NERC-funded project that is establishing integrated measurements of the meteorology, composition and particulate loading of London's urban atmosphere, complemented by an ambitious modeling programme.

The project established a new long-term measurement infrastructure in London encompassing measurement capabilities at street level and at elevated sites. These measurements were accompanied by high resolution modeling with the UK Met Office Unified model and WRF. This combined measuring/modelling approach enables us to identify the seasonal cycle in the meteorology and composition, together with the controlling processes. Two intensive observation periods in January/February 2012 and during the Olympics in summer 2012 measured London's atmosphere with higher level of detail. Data from these IOPs will enable us (i) to determine the vertical structure and evolution of the urban atmosphere (ii) to determine the chemical controls on ozone production, particularly the role of biogenic emissions and (iii) to determine the processes controlling the evolution of the size, distribution and composition of particulate matter.

We present results from the wintertime IOP in London focusing on a wintertime pollution episode during January 2012. We compare measured concentrations from top of BT Tower in central London with rural background measurements and determine the processes leading to the urban increment in pollutant concentrations. Therefore, we combine high-resolution simulations with the Met Office Unified Model for London and mixing layer heights derived from lidar measurements with air quality measurements in central London in order to quantify the role the boundary layer depth plays for London's concentrations.