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[Keynote Talk]: Monitoring of Ultrafine Particle Number and Size Distribution at One Urban Background Site in Leicester

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Abstract : Within the Joaquin project, ultrafine particles (UFP) are continuously measured at one urban background site in Leicester. The main aims are to examine the temporal and seasonal variations in UFP number concentration and size distribution in an urban environment, and to try to assess the added value of continuous UFP measurements. In addition, relations of UFP with more commonly monitored pollutants such as black carbon (BC), nitrogen oxides (NOX), particulate matter (PM2.5), and the lung deposited surface area(LDSA) were evaluated. The effects of meteorological conditions, particularly wind speed and direction, and also temperature on the observed distribution of ultrafine particles will be detailed. The study presents the results from an experimental investigation into the particle number concentration size distribution of UFP, BC, and NOX with measurements taken at the Automatic Urban and Rural Network (AURN) monitoring site in Leicester. The monitoring was performed as part of the EU project JOAQUIN (Joint Air Quality Initiative) supported by the INTERREG IVB NWE program. The total number concentrations (TNC) were measured by a water-based condensation particle counter (W-CPC) (TSI model 3783), the particle number concentrations (PNC) and size distributions were measured by an ultrafine particle monitor (UFP TSI model 3031), the BC by MAAP (Thermo-5012), the NOX by NO-NO2-NOx monitor (Thermos Scientific 42i), and a Nanoparticle Surface Area Monitor (NSAM, TSI 3550) was used to measure the LDSA (reported as μm2 cm−3) corresponding to the alveolar region of the lung between November 2013 and November 2015. The average concentrations of particle number concentrations were observed in summer with lower absolute values of PNC than in winter might be related mainly to particles directly emitted by traffic and to the more favorable conditions of atmospheric dispersion. Results showed a traffic-related diurnal variation of UFP, BC, NOX and LDSA with clear morning and evening rush hour peaks on weekdays, only an evening peak at the weekends. Correlation coefficients were calculated between UFP and other pollutants (BC and NOX). The highest correlation between them was found in winter months. Overall, the results support the notion that local traffic emissions were a major contributor of the atmospheric particles pollution and a clear seasonal pattern was found, with higher values during the cold season.

Keywords : size distribution, traffic emissions, UFP, urban area
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