

Monitoring of UFP concentration and size distribution at four urban background sites in NW-Europe

J. Staelens (VMM)
J. Hofman (VMM)
S.M.L. Hama (University of Leicester)
K.P. Wyche (University of Brighton)
G.P.A. Kos (ECN)
C. Matheussen (VMM)
R. Cordell (University of Leicester)
J. van der Laan (GGD Amsterdam)
J. Meydam (GGD Amsterdam)
K.L. Smallbone (University of Brighton)
K.F.A. Frumau (ECN)
E.P. Weijers (ECN)
P.S. Monks (University of Leicester)
E. Roekens (VMM)

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J. Staelens¹, J. Hofman¹, S.M.L. Hama², K.P. Wyche⁴, G. Kos⁵, C. Matheeußen¹, R. Cordell², J. van der Laan³, J. Meydam³, K.L. Smallbone⁴, A. Frumau⁵, E. Weijers⁵, P.S. Monks², E. Roekens¹

¹ Flemish Environment Agency (VMM), Department Air, Environment and Communication, Belgium

² University of Leicester, Department of Chemistry, United Kingdom

³ Public Health Service of Amsterdam, Department of Air Quality, the Netherlands

⁴ University of Brighton, School of Environment and Technology, United Kingdom

⁵ Energy research Centre of the Netherlands (ECN), Environment & Energy Engineering, the Netherlands

Corresponding author e-mail: j.staelens@vmm.be

Within the Joaquin project, ultrafine particles (UFP) are continuously measured at one urban background location in four cities in NW-Europe (Amsterdam, Antwerp, Leicester and London). The main aims are to investigate the temporal variation in UFP number concentration and size distribution, to assess the added value of UFP data in addition to more common parameters such as nitrogen oxides (NO_x) and black carbon (BC) and to evaluate the feasibility of long-term UFP measurements within air quality monitoring networks.

At all sites the total particle number concentration (PNC) was measured with a condensation particle counter (TSI-3783, particles < 1 µm) and BC with a MAAP (Thermo-5012). Information on the particle size distribution was obtained by a scanning mobility particle sizer (Grimm-5420/L-DMA) in Amsterdam and Antwerp and by a differential mobility analyzer with corona discharger and electrometer (TSI-3031) in Leicester and London.

To assess instrument comparability, there was an initial measurement campaign in Antwerp and follow-up comparisons at the four sites using a mobile trailer. The agreement between devices of the same type was good (<10% difference), but the total PNC was underestimated by the size-resolved devices compared with the particle counters.

Results will be presented based on 1-2 years of measurements, depending on the site. UFP, BC and NO₂ showed a clear traffic-related diurnal variation with morning and evening rush hour peaks on weekdays, but only a clear evening peak in the weekends. The relative distribution of particles in 5 size classes from 20 to 200 nm was quite similar at all sites, with the highest particle number in the 30-50 nm class. BC and NO₂ were correlated with the total and size-specific PNC, but the relationships depended on the site, probably reflecting differences in local site and traffic characteristics.

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ECN

Westerduinweg 3
1755 LE Petten
The Netherlands

P.O. Box 1
1755 LG Petten
The Netherlands

T +31 88 515 4949
F +31 88 515 8338
info@ecn.nl
www.ecn.nl

