

Home

Online Library ACP

- ▣ Recent Final Revised Papers
- ▣ [Volumes and Issues](#)
- ▣ Special Issues
- ▣ Library Search
- ▣ Title and Author Search

Online Library ACPD

Alerts & RSS Feeds

General Information

Submission

Review

Production

Subscription

Comment on a Paper

Impact
Factor
4.865

ISI
indexed



▣ [Volumes and Issues](#) ▣ [Contents of Issue 1](#)

Atmos. Chem. Phys., 4, 281-292, 2004

www.atmos-chem-phys.net/4/281/2004/

© Author(s) 2004. This work is licensed under a Creative Commons License.

Particle size distribution and particle mass measurements at urban, near-city and rural level in the Copenhagen area and Southern Sweden

M. Ketzel^{1,2}, P. Wählin¹, A. Kristensson², E. Swietlicki², R. Berkowicz¹, O. J. Nielsen³, and F. Palmgren¹

¹Department of Atmospheric Environment, National Environmental Research Institute, Roskilde, Denmark

²Division of Nuclear Physics, Physics Department, Lund University, Lund, Sweden

³Department of Chemistry, University of Copenhagen, Denmark

Abstract. Particle size distribution (size-range 3-900nm) and PM₁₀ was measured simultaneously at an urban background station in Copenhagen, a near-city background and a rural location during a period in September-November 2002. The study investigates the contribution from urban versus regional sources of particle number and mass concentration. The total particle number (ToN) and NO_x are well correlated at the urban and near-city level and show a distinct diurnal variation, indicating the common traffic source. The average ToN at the three stations differs by a factor of 3. The observed concentrations are 2500#cm⁻³, 4500#cm⁻³ and 7700#cm⁻³ at rural, near-city and urban level, respectively.

PM₁₀ and total particle volume (ToV) are well correlated between the three different stations and show similar concentration levels, in average within 30% relative difference, indicating a common source from long-range transport that dominates the concentrations at all locations.

Measures to reduce the local urban emissions of NO_x and ToN are likely to affect both the street level and urban background concentrations, while for PM₁₀ and ToV only measurable effects at the street level are probable. Taking into account the supposed stronger health effects of ultrafine particles reduction measures should address particle number emissions.

The traffic source contributes strongest in the 10-200nm particle size range. The maximum of the size distribution shifts from about 20-30nm at kerbside to 50-60nm at rural level. Particle formation events were observed in the 3-20nm size range at rural location in the afternoon hours, mainly under conditions with low concentrations of pre-existing aerosol particles.

The maximum in the size distribution of the "traffic contribution" seems to be shifted to about 28nm in the urban location compared to 22nm at kerbside. Assuming NO_x as an inert tracer on urban scale allows to estimate that ToN at urban level is reduced by 15-30% compared to kerbside. Particle removal processes, e.g. deposition and coagulation, which are most efficient for smallest particle sizes (<20nm) and condensational growth are likely mechanisms for the loss of particle number and the shift in particle size.

The maximum in the size distribution of the "traffic contribution" seems to be shifted to about 28nm in the urban location compared to 22nm at kerbside. Assuming NO_x as an inert tracer on urban scale allows to estimate that ToN at urban level is reduced by 15-30% compared to kerbside. Particle removal processes, e.g. deposition and coagulation, which are most efficient for smallest particle sizes (<20nm) and condensational growth are likely mechanisms for the loss of particle number and the shift in particle size.

condensational growth are likely mechanisms for the loss of particle number and the shift in particle size.

Search ACP

Library Search ▶▶

Author Search ▶▶

News

- ▣ [Sister Journals AMT & GMD](#)
- ▣ [Financial Support for Authors](#)
- ▣ [Journal Impact Factor](#)
- ▣ [Public Relations & Background Information](#)

Recent Papers

01 | ACP, 20 Feb 2009:
Intensification of tropical cyclones in the GFS model

02 | ACP, 20 Feb 2009:
Severe ozone air pollution in the Persian Gulf region

03 | ACP, 19 Feb 2009:
Increasing ozone in marine boundary layer inflow at the west coasts of North America and Europe

04 | ACP, 19 Feb 2009:
Influence of non-ideality on condensation to aerosol

■ [Final Revised Paper](#) (PDF, 478 KB) ■ [Discussion Paper](#) (ACPD)

Citation: Ketzel, M., Wählin, P., Kristensson, A., Swietlicki, E., Berkowicz, R., Nielsen, O. J., and Palmgren, F.: Particle size distribution and particle mass measurements at urban, near-city and rural level in the Copenhagen area and Southern Sweden, *Atmos. Chem. Phys.*, 4, 281-292, 2004. ■ [Bibtex](#) ■ [EndNote](#) ■ [Reference Manager](#)