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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Eddy covariance measurements and parameterisation of traffic related particle emissions in an urban environment" *by* E. M. Mårtensson et al.

Anonymous Referee #2

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Interactive comment on "Eddy covariance measurements and parameterisation of traffic related particle emissions in an urban environment" by Mårtensson et al.

This manuscript presents analysis of eddy covariance measurements in a city centre of Stockholm. The data are unique, it presents important estimations of a city as a source of fine and ultrafine aerosol particles. The measurements focus on the particle number and calculations of the number flux are presented. This study is worth publishing and is an important contribution in a field of atmospheric and urban aerosols. However, there are some aspects that the authors should consider (see below) and before publication

in ACP revisions are required.

Main comments

The footprint of an eddy covariance setup is very important when analysing the data and drawing conclusions. The footprint depends on several factors in the practical situation in question. The authors are no doubt experts in these experiments and I would like to see more detailed description of how the footprint was determined for these experiments. Especially, important question is how well the footprint fits to the classification of eight sectors in this study. These sectors are used as source areas and the emissions are estimated based on the traffic activity database concerning these sectors. Such an analysis is likely to increase the uncertainty of the number of vehicle kilometres driven within the source areas and consequently likely to increase the uncertainty of the emission factor EFfm and other related factors.

The emission factors are calculated based on data available for traffic intensity in the roads within the sectors. One would assume that the average speed of the cars is also influenced by the traffic intensity, i.e. more traffic indicates slower speed, even standing cars during morning and afternoon rush hour. How would that influence the analysis and is there any means to take into account such effects? Does the database include any data concerning the speed of the cars?

The aerosol particle number is even in a polluted urban environment from time to time dominated by atmospheric nucleation. Is there any possibility to separate such an event from the emissions from traffic and other anthropogenic sources?

Detailed comments

Page 5546, line 18: please explain symbols u and v.

Page 5547, lines 2-8: the sampling line length seems rather long when trying to measure accurately the total number concentration. Did you analyse the losses and what is the actual lower limit of the measure particle size? This analysis needs to take into

ACPD

5, S2762–S2765, 2005

account the fact that the flow was turbulent. Did you calibrate the system at any point?

Page 5547, line 18: Explain Obukhov length.

Page 5547, eq. 3: Explain F and Fm.

Page 5549, complementary measurements: Can you give the horizontal distance between all three measurement sites.

Page 5575, fig 3: The data measured at different locations is not directly comparable owing to different CPC's with different cutpoints. This fact influences also on the discussion on page 5552. This has to be discussed. Is there any size resolved data available during the campaign period? Sometimes major part of the total particle number is below 10 nm.

Page 5568, table 1: is the wind speed here 3-d or just horizontal? How does it relate to u and v (page 5546, line 18)?

Page 5553, line 2: Explain how you get 20Hz data from a CPC.

Page 5555 and fig 7: The data is averaged (if I understood correctly) over 30 min. This would mean that each 30 min time consists of contributions not only from one sector but also from some others. Is this conclusion correct and what consequences would it have?

Page 5556, line 13: This type of off-road machinery is often rather old diesel engine technology and could be very strong source of fine particles compared to normal vehicles, petrol or diesel driven.

Page 5557, line 18 and fig 10: The number concentration scale in fig 10 starts at 3000 cm-1. No data is below that value. At three o'clock the concentration is around 3000-4000 cm-1 for these sectors.

Figs 2 and 3: The decision of using Julian day as x-axes is somewhat confusing. I would recommend to have a date instead. I would recommend that at least this

ACPD

5, S2762–S2765, 2005

conversion is given in the figure caption, as for example in fig 4 and elsewhere in the text date is used.

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 5541, 2005.