Atmos. Chem. Phys. Discuss., 7, S2628–S2630, 2007
www.atmos-chem-phys-discuss.net/7/S2628/2007/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Evaluation and modeling of the size fractionated aerosol number concentration measurements near a major road in Helsinki" *by* T. Hussein et al.

T. Hussein et al.

Received and published: 25 June 2007

Reply to comments by Referee #1:

Kindly see our general reply to all reviewers submitted in "AC S2625".

1. It is well established that the nanoparticle formation in vehicular exhaust is very sensitive to the ambient temperature. Fig. 3 and 4 in the paper represent two different scenarios in which Case I is in summer time and Case II is in winter time. The maximum temperature difference between the cases is as large as 30 C. However, the measured nanoparticle concentrations at roadside in these two cases are of similar magnitude. Can you explain why there is no direct temperature effect on the measured nanoparticle concentration as observed in other field measurements? It is not clear from these

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

figures that the particle number concentrations at the roadside site would depend on ambient temperature (autumn versus winter). The logarithmic y-scale partly makes it difficult to check such changesFigure 7 (shown in this response) should support that after re-evaluating the size distributions with median values instead of means.

Usually the median is more representative than the mean, and therefore, we will update Figure 7 in the revised version.

2. It is clearly mentioned in the paper that “total particle number concentration decreased by 35-45% while transported from the roadside to a distance of about 60-80 m from the road”. However, Fig. 11(a) shows a 67 % reduction, from 4.5e05 cm-3 at 0 m from roadside to 1.5e5 cm-3 at 65 m from roadside in simulated number concentration in the “3x emission factor” case. Why does the model predict such high reduction in the particle number concentration, especially in the winter time case? To my best knowledge, the 35-45% reduction (Zhu et al., 2002) was observed at summer time when the nanoparticles tend to shrink quickly, leading to more decrease in particle number concentration as opposed to winter time. 3. It seems to me that the reduction in particle concentration is also sensitive to the initial emission factor. Fig. 11 shows that there is a considerable difference in the particle concentration reduction between Base case and 3x emission factor case. Can you explain how the change in emission factor affects the particle evolution? This is a combined reply to the previous points: based on the available data for this study it is very difficult to discuss this matter and how much the particle concentrations should decrease at 65 m. However, the model exercise clearly revealed that the emission factor was not suitable for this case even though it was previously evaluated for the same season in a different year. In general, the dilution of aerosol particles nearby a road is dependent on the background size distribution; and the ratio of road contribution to urban background is substantially different for smaller and larger (i.e., accumulation mode) particles. This effect will be discussed in more detail in the revised Pohjola et al. manuscript. The 3x emission factor provides substantial amounts of aerosol particles that are diluted quickly in comparison to the base case

ACPD

7, S2628–S2630, 2007

(1x emission factor); though with the 3x case showed two times the concentrations of the base case at 65 m, whereas the concentrations at 0 m were about three times.

The size distribution of the used emission factors may also not be sufficiently accurate. The maximum value of the size distribution of the emission factor was mainly around 20 nm whereas the maximum value of the measured particle number size distribution at 65 m was around 10 nm. This brings many issues in the evolution of the particle number size distributions with respect to the condensation and coagulation growth in addition to the dilution with the background air.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 4001, 2007.