Atmos. Chem. Phys. Discuss., 8, S6749–S6752, 2008
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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Intra-community spatial variability of particulate matter size distributions in southern California/Los Angeles" *by* M. Krudysz et al.

Anonymous Referee #1

Received and published: 7 September 2008

This manuscript presents an analysis of the spatial, diurnal and seasonal dependence of particle number size distributions in the vicinity of the Ports of Los Angeles and Long Beach. Particle size distributions were monitored at 13 sites from April to December, 2007. Spatial variation analysis was made by calculating the coefficient of divergence and correlation coefficients between site pairs. The data are interesting but unfortunately, in some places the manuscript suffers from unsufficient arguments so that many conclusions are not scientifically solid. Thus the manuscript needs major revision before publication in ACP.

General comments:

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Interactive Discussion
Discussion Paper

The average particle size distributions for each site and sampling period are presented in Figures 2a-2g. The authors conclude that for most of the sites, a single mode is present at particle sizes 20-60 nm. This is disagreement with the other studies mentioned in the manuscript; for example, Hussein et al., 2005 reported two modes - nucleation mode $<$ 25 nm and Aitken mode 25-90 nm. Log normal modes should be fitted to the observations. After this additional information I believe that the conclusions will be changed. I am also wondering in Table 1 why the geometric mean diameters for the whole size distributions are calculated. What do they describe? I would suggest to calculate the modal geometric mean diameters with std.

The authors state that for the measurement sites LB2, LB8, LB9, W3 (section 3.2.1) higher average particle number concentrations (Ntot) and larger number median diameters in winter than in summer (cf. Figure 2c, e and f and Table 1) could be explained by higher RH in winter. However, the average particle number concentrations given in Table 1 are in contradiction with the above statement because only for W3 the winter Ntot is higher than in summer. Furthermore, only at LB2 the mean value of RH is clearly larger in winter than in summer. What is the explanation for higher concentrations in winter as shown by Fig. 2e,f,g because the average temperature differences in winter and summer are very small (Table 1). Please, check all values in Table 1. Some statistics for T and RH are needed.

I would expect clear differences in number size distributions during weekdays and weekends. However, the authors have not taken this into account when studying diurnal variability analysis. Could you comment this?

By comparing the background locations SP1 and LB1 (Fig. 6a) very high spatial divergence was observed for particles $<$ 20 nm whereas for larger particles spatial divergence was smaller. The authors state that one reason is that LB1 is influenced by transient emissions from ships entering and leaving the harbour. What is typical size distribution for the ship emissions? I would expect not only high nucleation mode but also high Aitken mode. Its effects should be included in your conclusions.

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Interactive Comment

Specific comments:

p. 9643, line 16: Puustinen et al, 2007 does not study LA locations

p. 9643, line 29: coagulation might also be important (Kerminen et al., Atmos. Environ., 41, 1759-1767, 2007)

p. 9645, line 3 : the reference Moore et al., 2008 is missing from the reference list

p. 9645, line 10: industrial sources are mentioned here but their effects have not been discussed section 3 Results and discussion.

p. 9645, line 17: explain the abbreviations PoLA and PoLB

p. 9647, line 9: might be good to mention the particle size range measured by CPC, and the number of size sections recorded by SMPS

p. 9649, line 2: where are the meteorological data measured?

p. 9649, line 2:what do you mean here by the word consistent?

p. 9651, lines 23-26: these qualitative statements need more precise quantification, eg. by positive matrix factorization (see eg. Krecl et al., ACPD, 8, 5725-5760,2008)

p. 9652, line 27: You mention that nucleation mode at around 20 nm from vehicle emissions arises from condensation of organic species onto solid nuclei (Morawska and Zhang, 2002). The recent studies show that nucleated particles might be formed by binary homogeneous H2SO4-H2O nucleation (volatile nuclei) after the exhaust tube or have non-volatile core formed already in the engine (see eg. Rönkkö et al., Environ. Science and Technology, 41, 6384-6389, 2006.

p. 9653, line 10: smaller and larger particles - give more specific values

p. 9654, line 8: “PM size distribution” is misleading word for number size distribution. This is mentioned many times also in Introduction.

p. 9657, line 11, W2 to LB9 LB5, is the word AND missing

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Interactive Comment

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Figure 2 and 6: The quality of the figures is not good ehough since it is hard to distinguish the curves.

Figure 7: LB2 should read W2 in the figure caption

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