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Atmospheric Chemistry and Physics Discussions

Interactive comment on "An investigation of nucleation events in a coastal urban environment in the Southern Hemisphere" *by* J. F. Mejía and L. Morawska

J. F. Mejía and L. Morawska

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General Comments:

The manuscript (An investigation of nucleation events in a coastal urban environment in the Southern Hemisphere) by J. F. Mejía and L. Morawska presents an interesting data set in an area which still is and will be for the near future very important for the scope of ACP. The small amount of measurements available from places outside of Europe and North America makes the data collected during 5 campaigns in West-Australia very valuable. Although I have to agree to the referee 1 that at this stage the manuscript is not in the way it could be published in Atmospheric Chemistry and Physics. The authors need to put more effort in the analyses of the data and rethink

the way to present the measurements.

I do not want to mention all the points from the first referee again (although I agree with him completely) but more concentrate on some additional comments which hopefully could contribute to the improvement of the manuscript and its publication in ACP

(See responses to specific comments)

Response:

The general comments are consistent with those made by reviewer 1 and therefore no responses are necessary here as they are contained in the responses to that reviewer.

Specific Comments:

Comment 1:

Dividing the measured particle size distributions in event and non-event days with the limitation of the high cut off size at 14 nm will be problematic even with the clear criteria given by referee 1. One possibility would be to calculate certain aerosol dynamic parameters for each day (growth rate, condensation and coagulation sink) and use this information to get J values at lower sizes based on the formula published originally by Kerminen and Kulmala (J. Aerosol Science, 33, 6098211, 622, 2002). In this way the authors could distinguish between days with high nucleation rates and low and could get also information about the concentrations of the condensing vapors.

Response: The formula proposed by the reviewer helps to calculate the concentration of particles as small as 1 nm. However, the application of the formula requires some conditions that the database used in the study did not satisfy due to instrumental limitations. For instance, the cut-off diameter, 14 nm, was too large. Also, the formula requires the pre-existing size distribution to remain fairly constant whereas the short duration of the nucleation events showed that the distributions experienced very quick fluctuations.

ACPD

9, S2999–S3002, 2009

Interactive Comment

Since the objective was the identification of nucleation events, not the nucleation rate, the definition of the marker for nucleation, as explained in the first paragraph of section 2.3, helped to implement a much simpler method for the detection of nucleation events. Also, the focus of the study was to investigate whether the local traffic was an important source of secondary particles (see response to reviewer 1, general comments, point 5) and since the results indicated that it was not the case, no further analysis was required. Therefore, the method described in the above section was reasonable appropriate for the present investigation.

Comment 2:

The plots in Figure 2 should then be divided for days with observed or calculated new particle formation and non-event days. In the way the authors presented this figure at the moment, only small valuable information is achieved.

Response:

This comment is similar to comment 3 of reviewer 1. Therefore, please refer to our response to that comment.

Comment 3:

Concerning the distribution of the event and non-event days in sections of air origin back trajectories would add important information and should be considered beside measured wind direction. By comparing these graphs for event and non-event days a more clear pattern concerning the observed particles in the different size ranges could appear.

Response:

Once again, we remind the reviewer that the focus of this study was to investigate whether the local traffic was an important source of secondary particles in the study area. Since the results showed that it was not the case, no further analyses were needed. Nevertheless, the details when nucleation events occurred were recorded

ACPD

9, S2999–S3002, 2009

(see Table 1): these included date and time, wind conditions and prevailing wind direction sectors. Also, as indicated at the end of section 2.4, wind direction data was divided into wind direction sectors in order to identify the principal sources of secondary particles. As shown in our response to comment 3 of reviewer 1, 8220;the events were associated with air masses of local origin8221;. Therefore, the sources of secondary particles were easily identified and therefore further back trajectory analyses were not needed.

Comment 4:

The results in point 2.5 (should not be under methods) and the discussion under 3 are at this stage only a listing of the observations without combining it to scientific valuable information. The authors should spend more time in thinking of the reasons why new particle formation was observed on certain days and why not by using their measurements and hopefully some simple modelling tools as mentioned above.

Response:

The necessary corrections were made and now the results are listed under section 3 and the discussion under section 4.

The atmospheric conditions prior and during the nucleation events were recorded in Tables 1 and 2. The discussion (pages 2205-2008) makes substantial use of literature in order to explain how the atmospheric conditions prior and during nucleation influenced the results. Comparisons with the results from overseas studies are consistently made throughout the text in order to explain how the local environment influenced the probability of nucleation. In page 2207 (lines 6-15), we discuss why the predominance of diesel traffic emissions reduce the probability of nucleation in the study area.

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ACPD

9, S2999–S3002, 2009

Interactive Comment