

## ***Interactive comment on* “Contribution of mixing in the ABL to new particle formation based on some observations” by J. Lauros et al.**

### **Anonymous Referee #1**

Received and published: 20 July 2007

#### General comments:

Based on observations the paper describes the formation of new aerosol particles in the boundary layer in relation to meteorological conditions. Even though the paper presents interesting concepts and results I have great problems with the text and suggest that the manuscript should be considered for publication in ACP only after major revisions. I am particular concerned about the structure of the text as well as its readability.

What are the important parameters? How were they obtained from the measurements? How are they fed into which model? What is the output and how is it interpreted? The answers to these questions might be somewhere in the text, but even after reading it a

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couples of times I could not sort out properly what was really done here. I acknowledge that complicated physical processes and modelling approaches are described here but the authors should spend a lot more effort in describing concisely their major steps with a great deal less formulas and a lot more clear sentences.

The results and its relevance are not very clear to me either. One reason for this is that section 4 spends a lot of space in further explaining methods instead of presenting and interpreting the results. See the specific comments for further details.

The most robust result seems to be that new particle formation is strongly linked with vertical mixing. In the conclusions the authors state that their observations support the hypothesis that the growths of nanoclusters is the bottleneck for particle formation rather than their nucleation. I don't even have a clue how this can be derived from the results that were presented.

What about the sources of precursors gases and their relation to meteorology? There is no discussion at all on additional parameters that were not observed which can also influence the results. There is also no information on the selection of the days that were investigated. In the abstract the authors state that the connection of mesoscale meteorology with particle formation was studied. I could not find it in the text.

My overall impression is, that there are some valuable observations and there are some interesting concepts on how to interpret them. However, it takes a lot additional effort to work these out properly in order to obtain clear results and to draw robust conclusions.

Specific comments:

Abstract Page 7536, Line 11: "may also be good indicators" - what is this idea based on

Page 7537, line 26: "...the previously described hypothesis.." - It is not clear which of the points you made in the preceding paragraphs is the hypothesis you are referring to.

Page 7537, line 28ff Please explain in more detail why surface measurements are

not sufficient, the advantages of your study compared to previous studies, and what additional results can be expected.

Page 7538, line 17 Please explain why you choose  $170\text{kJmol}^{-1}$  in the study.

Page 7539, line 9 What  $z_1$  and  $z_2$  are standing for?

Page 7539, line 15 What is meant with material? Data? This chapter seems to be a mixture of measurements description but also data treatment for further analysis. Therefore it is very difficult to follow the author's ideas. I suggest to separate these two topics more clearly. A table with overview on the measurements from the different sites and the altitude they are located would be of great for an interested reader.

Page 7539, first paragraph For the reader it is not clear, why we have 100 days selected within the two years and how these days have been selected (criteria?). Out of how many measurements these have been selected (percentage)? This would help to see how representative the selection is. At the present stage it is not clear why this selection is needed for the study performed. Still unclear what a event and nonevent day stands for.

Page 7539, line 24 "Our study based on ..." What assumptions, which model, what estimates? A very confusing paragraph!

Page 7540, line 15 Please add here why the mixing height is important for your study - this is not clear from the text at this point.

Page 7540, line 25 " was above the surface layer for most." . Please give a percentage how often this was the case.

Page 7541, formula 2 what are the primes referring to?

Page 7541, line 5 Please explain abbreviation used in the formula.

Page 7541, line 15 Finally some explanation about "nonevent" and "event" days. I would suggest to have this long before or use these expressions from only from this

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point. Anyhow the explanation is rather short and just referring to a reference. As this deviation seems central for the analysis some more sentences for the understanding would be more than helpful.

Page 7541, line 19 You stated that spatial and altitude differences can be ignored. Is this due to the fact that these influences assumed to be very small and therefore be negligible? Please comment on this and add a sentence in the manuscript.

Page 7541, line 20 I did not understand whether this model you are describing is an already existing model or you adopted for your needs or you developed it yourself. If the model is not new I would highly suggest shortening this part and just refer to the references. Otherwise please indicate in the text that this is a new idea and new model.

Page 7543, line 16 ff It is difficult to follow the content as there are rather big amounts of formulas in which not all the elements are well described. The question is, how necessary are these for the general idea?

Page 7544, line 7 What is  $\langle \rangle$  standing for? I think it should be in brackets.

Page 7543, line 10 Skip the formula as it is clear what is meant with the difference.

Page 7544, formula 7 The binomial regression method is a standard method and it should be referred to a reference instead of repeating the formulas at this point. It would be of more interest what information you like to gain from the application of this method. Please explain.

Page 7545, line 1 Here again it is not clear what Pmet is standing for. Is it the effect of meteorology as mentioned then at page 7546 line 16?

Page 7545, line 4 Grammar seems to be wrong “on which”.

Page 7545, line 24 Can the authors explain reasons for these observed differences?

Page 7546, line 4 BIOFOR - please explain the abbreviation.

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Page 7546, line 6 The authors mentioned for the first time synoptic conditions. What are the synoptic situations during the investigated results? What is the influence on the results? How important are they for the study as the authors mentioned the differences to the study performed by Nilsson et al., 2001b. Please add here the corresponding points and discussion.

Page 7546, line 7 Please do not use formulas in a header.

Page 7546, line 8 “observe” should be "calculated". As I understand, the results used are coming from the applied model and thus are calculated values.

Page 7546, line 13 "Some profiles..." I think it is the 29 March 2003 which was chosen as an example but what is meant with some time, or model results? Please rephrase the sentence.

Page 7547, line 13 Studied conditions in brackets - are these ranges coming from the measurements or are they assumptions to perform the calculations?

Page 7547, last paragraph It is difficult to follow the analysis here as the amount of abbreviations are high. State out which are the three cases and then describe the results. Please rephrase this part in order to make the reading much easier.

Page 7548, line 1 The following equations. There are no equations following so it is not clear to the reader what this is referring to.

Page 7548, line 9 " ... have shown that the...". Please add where in the manuscript this was done.

Page 7548, line 18 Unclear, please rephrase.

Page 7548, line 25 Please explain in more detail that the saturation ratio decreases instead of increasing. Is the latter what you expected? Why does this happen?

Page 7548, line 27 "... much smaller source would enable growth and activation". Explain what much smaller means. 50%, 20%. This is a vague description of the

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possible influence.

Page 7549, line 2 Again it is difficult to follow your analysis as there are formulas instead of a simple words for what we are looking at.

Page 7549, line 27 Why these numbers are different to the amount of event and non-event days mentioned earlier - page 7539 line 17. Please explain these differences. Please explain further in which sense the data are limited due to other investigations as the data encompasses two years.

Page 7550, formula 10 This formula should not appear here. Should be written in section 3.4 statistical tools.

Page 7550, formula 11 This formula should be included with general factors in Table 2 and not being specified for one case here. This is not necessary and interrupts the reading as well as the understanding. All the factors in the formula can be found in Table 2.

Page 7550, line 24 For the first time triplet application is mentioned here. Why should this be performed? Advantage should be mentioned in section 3.4.

Page 7552, line 13 'The effect of sources and entrainment of drier and cleaner air at the top of the atmosphere were ignored in our study'. How realistic is this assumption?

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Interactive comment on Atmos. Chem. Phys. Discuss., 7, 7535, 2007.

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