

## ***Interactive comment on “Particle formation at a continental background site: comparison of model results with observations” by U.Uhrner et al.***

**U.Uhrner et al.**

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Author's response to anonymous referee 1 on behalf of all co-authors

We thank the anonymous referee 1 for very constructive comments regarding the overall clarity of the article and particularly concerning the limited number of cases.

### GENERAL COMMENTS:

It seems we missed to clarify the relatively small percentage of days of the total measurement period with event categories I and II, based on the selection criteria of N [3-11nm].

a) From the 2.5 years measurement period, 46 cases showed significant nucleation (Birmili et al. 2002, Type I and II). These 46 cases represent a small percentage of

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days of the overall measurement period.

b) Careful examination of these 46 data sets, resulted in our selection in 12 suitable cases for the box-model investigations described. The criteria used to select these cases are, outlined in section 3.2. These cases represent a set of meteorologically “well” defined situations and not a random selection.

c) These 12 cases, and not only 4 as stated by the referee, were analysed with respect to the correction factors needed to match observed and calculated number concentrations (see Figures 5 - 8).

The authors already considered to analyse the seasonal variation of the correction factor. However, due to the relatively low number of events and their inhomogeneous occurrence over the course of a year (see companion article by Birmili et al., 2002) this would not yield meaningful results.

The referee stated that the applied model did not really describe the aerosol formation because of the strongly fluctuating correction factor. In this context it should be noted that the correction factor was used as an indicator to distinguish between situations where the box-model seems to be applicable or fails. Failure was attributed to e.g. meteorological mixing processes not accounted for !

As the referee was obviously misled by abstract and introduction both parts were re-written clarifying the above reasoning. In addition the last section of the abstract which was exaggerated was replaced.

#### SPECIFIC COMMENTS:

ABSTRACT: We changed the abstract accordingly. Now, it is clearly stated, that the box model simulations represent only a limited, selected number of cases.

Lines 9-10: The referee is correct, changed accordingly.

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Lines 12-17: This section was completely re-written.

INTRODUCTION: Page 2416, Lines 20-23: According to the author's opinion, statements like this don't belong into an introduction. According to Page 2424, Lines 14-17 and figure 2, the total initial number concentration is not zero.

Section 3.2, Page 2421, Lines 20-23: For further clarification, this paragraph was rewritten at the beginning of this section:

In order to compare modelled results against measured results the appropriate use of a box model has to be justified. Consequently due to the underlying assumption of horizontal homogeneous conditions suitable cases must be carefully selected in order to exclude strong effects of wind veering and inhomogeneities due to the terrain on aerosol dynamical processes. In the companion article (Birmili et al. 2002) 46 data sets were classified as Type "I" or "II" (strong and medium events) and comprised only a small fraction of the HAFEX campaign (1998–2000). This classification was purely based on the particle number concentration for particles sized between 3 and 11 nm. From these 46 data sets, cases were selected that matched the following criteria:

In order to make it clearer at the end of this section, Page 2422, Lines 11-13 were changed to:

12 data sets met these criteria, and these are summarized in table 1. The sentence "A further limiting criterion was the availability of simultaneously measured of T, RH,  $\text{H}_2\text{SO}_4(\text{g})$ , wind and size distribution data in the periods of interest", which affected ten event cases in this study was replaced and put as an item to the criteria:

- availability of simultaneously measured temperature, humidity,  $\text{H}_2\text{SO}_4$ , wind and size distribution data in the period of interest.

Also to make things clearer, subsection heading 4.1 Page 2425 Line 2 was changed: "Data sets selected for detailed comparison" to: "Four data sets selected for detailed comparison".

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RESULTS: Page 2427, Lines 5-17 Assuming the reviewer wanted to point out that there could be a relation between  $cf$  and the discrepancies of measured and calculated particle surface area, we amended accordingly on Page 2427, Line 13: Any significant impact of  $cf$  on discrepancies between measured and calculated particle surface area can be ruled out, because the  $cf$  affects noticeably only the zero moment.

Page 2428: Lines 5-10: To make it clearer the heading was specified: Heading of subsection 4.2 Page 2427, Line 18: “Micrometeorological influence” to: “Micrometeorological influence on April 20 and May 19, 1998”.

further we changed Page 2428: Lines 6: changed “However for some days there ..” to: “However for 20 April and 19 May there ...”.

Page 2428: Lines 28 - Page 2428, Line 9: We accept that the hypothesis is not clearly proved. Therefore Page 2428: Lines 28 - Page 2428, Line 9 were deleted.

Section 4.3: As outlined above, the author's are unable to pick up this suggestion.

CONCLUSIONS: Page 2434, Line 11: The referee is right that we did not use a constant correction factor throughout the investigation.

We rephrased this to: “The differences for particle number concentration were evaluated by determining for each case a correction factor for the nucleation rate expression, which was the only free parameter in the model.”

#### References:

Birmili, W., Berresheim, H., Plass-Dülmer, C., Elste, T., Gilge, S., Wiedensohler, A., and Uhrner, U., The Hohenpeissenberg aerosol formation experiment (HAFEX): a long-term study including size-resolved aerosol and  $\text{H}_2\text{SO}_4$ , OH and terpene measurements, Atmos. Chem. Phys. Discuss., 2, 1655–1697, 2002. Now accepted for ACP.

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