

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

### **Anonymous Referee #1**

Received and published: 10 February 2003

The manuscript describes the results of a two-component model using field measurements of meteorological parameters, gas-phase sulphuric acid and particle size distribution, in order to describe aerosol formation at a continental background area. The model was applied for 12 cases that were selected from a two-year campaign. The findings of the model were corrected by a "free" correction factor (cf), and they are compared against direct measurements. On the basis of this comparison, authors stated that "a distant particle-formation process under convective conditions near the interface of the mixed layer and the entrainment zone, followed by downward transport and particle growth" is the most likely pathway.

This paper should be accepted for publication at ACP; however major revisions are required in order to clearly present the scope and the findings of this study to the reader and provide a considerable input on particle formation studies.

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## GENERAL COMMENTS:

As stated in the manuscript, measurements took place for 2 1/2 years, thus a huge number of cases were available, with a clear seasonal variation. This database, is valuable to understand particle formation and its characteristics. However, authors stated that only 46 cases were selected (and classified as Typel and Type II) on the basis of a set of meteorological/atmospheric criteria throughout 2 1/2 years. These conditions accounted for a small fraction of the database, indicating that these events are rare and most likely random. In addition, only four cases were finally analyzed due to measurement limitations, however, this scenario was also applied (it is not clear how this was done) to the remaining eight cases. Furthermore, this model did not really describe aerosol formation because a correction factor, that fluctuates from  $10^{-3}$  up to  $10^{17}$  was included.

I believe that the results of this study do not clearly confirm (or indicate) the proposed mechanism. The important outcome of this study is the seasonal profile of the correction factor, its physical/chemical explanation and its dependence on meteorological parameters, gas phase concentration levels and particle size distribution. I strongly recommend that authors should focus on this issue. In all cases, a larger data set should be examined, in order to obtain a sufficient set of results (including fall and summer cases). A set of publications are already cited (Birmili et al., 2002), however, a limited number of results should be included that are essential for the readers and for the scientific value of this paper.

For this reason, authors should:

- a) Add a list (in the form of a table) of the atmospheric conditions observed in the area, including particle formation events and;
- b) Provide an adequate explanation why are these criteria selected and why these Types of atmospheric conditions are important.

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c) Apply this model on a larger set of cases (as it is done in the remaining eight cases) and describe correction factor variance under different atmospheric conditions.

#### SPECIFIC COMMENTS:

Abstract: Given the aforementioned comments, authors should clearly state that the box-model simulations were done for specific cases (Type I and II; authors should include a very brief description of their cases) that represent a limited number of cases.

Lines 9-10: I think that it is rather uncommon, even for field measurements, to propose a seasonal profile/meteorological dependence using an extremely limited number of cases. Author should delete this section.

Line 12-17: Authors should clarify that this statement is true for a certain "type" of atmospheric-transport conditions. Otherwise, more cases should be included that represent a significant portion of the measurement campaign.

#### INTRODUCTION:

Page 2416, Lines 20-23: Authors should include a sentence to describe whether initial particle number concentration was 0 or not.

#### RESULTS:

Page 2427, Lines 5-17: There is a clear discrepancy between measured (or calculated based on particle size distribution data and assuming spherical particles) and estimated particle surface. Can this be attributed to the  $\sigma_{sc}$  values that are artificially taken?

Page 2428, Lines 5-10: Authors should clarify whether data from radiosonde station at Munich-Oderschleissheim are used for the four cases. If yes, please include them. If no, this statement about the development and height of the boundary layer should be deleted.

Page 2428, Line 28 through Page 2429, Line 9: This statement is not clearly proved.

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As authors also stated, measurements/estimations of turbulent heat fluxes and particle flux measurements were not available. This hypothesis should be excluded.

Section 4.3. Comparisons of measured and simulated results: Authors should include a larger dataset and focus on the variance of 'cf' and its correlations with atmospheric and meteorological parameters.

#### CONCLUSIONS:

Page 2434, Line 11: "by using a constant correction factor". 'cf' is not constant. It should be rephrased.

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Interactive comment on Atmos. Chem. Phys. Discuss., 2, 2413, 2002.

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