

## ***Interactive comment on “Analysis of extinction properties as a function of relative humidity using a $\kappa$ -EC-Mie model in Nanjing” by Zefeng Zhang et al.***

### **Anonymous Referee #2**

Received and published: 6 June 2016

#### Referee Comment

#### General comment:

The manuscript presents interesting results on aerosol extinction modelling using microphysical aerosol parameters obtained by other measurements. Also, the introduction gives a reasonable overview about the recently published articles in the area. A simple core-shell model is used to compare experimental and modelled data. The dataset is in general a bit short, but sufficient to test the model. Figures and tables are in most cases clear, but figure descriptions need some more work. Especially the paper text is sometimes not fluent and some English correction is recommended before publication. The discussion part is precise, but I suggest to add one or two more figures

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presenting the results that were used for the model exercises. In general, the Nanjing dataset is used as in a lab study only to test the model. I suggest to put the measurements at this special place into context to similar measurements that were carried out at other sites. The article may be published in ACP when the following comments are taken into account.

Detailed scientific comments:

## Abstract

Page 1, Line 15 – 22: Comment: You sometimes use extinction, then extinction coefficient, then volume extinction coefficient. Be clear and specify the parameter you are talking about!

## 1 Introduction

Page 2, Line 13: Add: ... even at subsaturated conditions.

Page 2, Line 13: Change: ...of the particles can lead ...

Page 2, Line 16-17: ...and the extinction associated with different particles is ... Comment: What do you mean here with different particles: size classes, chemistry? Please clarify!

Page 2, Line 25: Change: ... of the overall aerosol population.

Page 2, Line 29: Add: ... based on the observed aerosol.

Page 3, Line 2: Change: Therefore, we have established ...

Page 3, Line 18: Comment: I would rather more say here that kappa can be considered a function of the volume fraction of the hygroscopic and therewith non-light absorbing components and the volume fraction of the non-hygroscopic and therewith light-absorbing component which here can be assumed to be EC. In this way hygroscopic and optical properties can be understood to have a strong linkage.

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## 2 Experiment and Methods

Page 4, Line 18-24: Comment: Which parameter for the size distribution is measured: mass, number? Please specify!

Page 4, Line 26: Change: The size distributions are provided in section as follows: . . .

Page 5, Line 2: Comment: I would expect here a short description (two sentences) of the processing steps.

Page 5, Line 4: Comment: A detailed description of what was provided?

Page 5, Line 6: Comment: Again, I would expect here a short description!

Page 5, Line 9-10: Comment: Check this sentence, this is not a full sentence!

Page 5, Line 10-14: Comment: Again, I would expect here a short description of the visibility meter!

Page 5, Line 20-21: Comment: You have to specify which method you used (Gysel or Topping)?

Page 6, Line 1: Comment: Specify exactly what are the parameters  $i$ ,  $N$ , etc. in formula (1).

Page 6, Line 12-14: Comment: Be correct! Change: . . . molecular weight of water, . . . the ideal gas constant,  $T$  the temperature with a value of 20 degree C, . . .

## 3 Results and Discussion

Page 6, Line 18: Comment: I would like an explanation here why this simplification of calculation of the extinction coefficient based on visibility measurements can be done. Please give here the scientific background!

Page 6, Line 20 Comment: If you use the wording size distribution, you have to specify which parameter you mean. In this case you mean particle number size distribution, I guess. Please take care over the whole manuscript! Also in Figure 3 description.

Page 6, Line 20-22: Comment: Can you give some statistical evidence on this statement. You should look for the correlation coefficient here.

Page 6, Line 25 and ongoing: Comment: I would say the variation between size segments is higher compared to the variation over time within one size segment especially for kappa. Please make sure that you mention the time resolution of the Anderson in your study in section 2! I cannot see it there.

Page 7, Line 13 – 15: Please rephrase this sentence. Physicochemical properties can be different for the same size of particles, but in this case the chemical composition is different.

Page 7, Line 27 and ongoing: Comment: This section contains some information that should be relocated to the instrumental section 2 or even is there now. Please shorten and make more clear!

Page 8, Line 12: Add: ... of the extinction coefficient ...

Page 8, Line 20: Change: ... the following section focusses on the measurements and calculations at  $\lambda = 550$  nm for discussion.

Page 9, Line 1: Comment: I would rather call this the relative contributing fraction of different size segments to the dry aerosol extinction coefficient. The same I suggest for Figure 7 and Figure 8 descriptions and all other parts of the manuscript.

Page 9, Line 3 and ongoing: Comment: This is really an interesting finding. But I still understand that you measured PM<sub>2.5</sub> and not PM<sub>10</sub>! I suggest here that a plot showing the overview of particle number or even better particle mass size distribution is included, maybe only as an average value for the whole campaign.

Page 9, Figure 9: Comment: Figure axis units and legends/symbols are too small. Figure description is incomplete as missing for Figure 9b.

Page 9, Line 13 – 22: Comment: Put the absolute measurements in context to data

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from other sites you will find in the literature! Otherwise, you only use Nanjing as a lab study to test your model.

Page 9, Line 23 – Page 10, Line 11: What can you conclude from this finding. Can you look into the chemistry and find possible explanations!

Page 10, Line 12 – Page 11, Line 1: Comment: Honestly, I got lost in this paragraph. Please choose a more appropriate way to explain the details of your calculations and corresponding findings!

#### 4 Conclusions

Page 11, Line 10: Add: ... measured values (...) that were derived from ...

Detailed technical and language comments:

#### Abstract

Page 1, Line 15: Change: ... produced reasonable results.

#### 1 Introduction

Page 2, Line 3-4: Change: ... is mainly caused by the increase of particle number or mass concentrations and can lead... (.. such as cardiovascular diseases. ..) and can further lead to an increase of traffic accidents ...

Page 2, Line 28: Change ... though...

Page 3, Line 9: Change: ... indices...

Page 3, Line 11: Change: She found ...

Page 3, Line 15: Comment: There are two points after the sentence.

Page 3, Line 21: Change: ... of the particles... Then, we can calculate...

Page 3, Line 24: Add: ... of the observed aerosols.

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Page 4, Line 3: Change: ... in dependence of RH and ...different particle size ranges.

## 2 Experiment and Methods

Page 4, Line 8: Shorten: ... above ground level.

Page 5, Line 6: Change: EC and OC were determined ...The measurement principle...

Page 5, Line 25-26: Change: We obtained ... density of 1.7 ... we calculated...

Page 6, Line 3: Add: ...material component

## 3 Results and Discussion

Figure 1: Change: Data coverage ...

Figure 2: Change: ...observation period.

Figure 3: Change :... particle number size distribution ...

Page 6, Line 21 Change: ... that the periods with high number concentrations had a good consistency with ...

Page 6, Line 20-22: Change: ... for different particle size segments ...

Figure 4: Change : ... in different size segments ...

Page 6, Line 20-22: Change: ... for different particle size segments ...

Page 7, Line 18: Change: ... the calculated results ...

Page 7, Line 24 – 25: Change: ... GF is a function of kappa and the hygroscopic uptake of EC is minor ...

Page 8, Line 23: Change: Contributing ...

Page 9, Figure 26: Change: ... was larger than ...

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## 4 Conclusions

Page 11, Line 24 Change: ... size ranges.

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Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-119, 2016.

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