Atmos. Meas. Tech. Discuss., 2, C1165–C1167, 2010
www.atmos-meas-tech-discuss.net/2/C1165/2010/


Atmospheric Measurement Techniques Discussions



# *Interactive comment on* "A model of aerosol evaporation kinetics in a thermodenuder" *by* C. D. Cappa

**Anonymous Referee #2**

Received and published: 25 January 2010

General comments

This manuscript presents an approach to the analysis of thermodenuder (TD) data that is intended to be more quantitative. The basic idea is to simulate the kinetics in the TD by fundamental mass transfer equations and the current model shows a semi-quantitative agreement with previous measurement data. Based on this model, additional exemplary case studies were also made to address the effects of different parameters on the mass fraction remaining. This model makes it possible to extract a clearer picture of the relationship between the mass thermograms and aerosol volatility properties. It is therefore a good start and attempt for a quantitative understanding of the TD measurement results. I have checked the model equations and found they are all correct. This study merits publication to the atmospheric community and the subject is appropriate for AMT. Concerning its value in the TD analysis, I recommend publication of this manuscript as it is.

Specific comments:

Here are my comments and suggestions, only for the author's concern:

1. Adding an appendix of model equations

The governing equations of the model are two partial differential equations, which could be easily coded nowadays, e.g. by Matlab. Adding a compact list of model equations would help people understand and apply the model in their studies. Also it is necessary to explicitly write the initial and boundary conditions for the partial differential equations.

e.g. Governing differential equations: ... Initial and boundary conditions: ... Prescribed parameters: velocity and temperature profile ... Other equations: ... Notes: .. the diffusional and thermophoretic particle loss is not included in the model.

2. Moving sect 3.6 to 3.1, model validations should come before further discussions.

The modeled results in Fig. 10 are steeper than the measurements. Since mono disperse aerosols in measurements are not perfectly mono-dispersed because of the DMA transfer function, the dispersion of observed spectra would be expected. I am not sure if this could explain the differences in Fig 10.

3. Adding tables for model configurations used in exemplary case studies (3.1-7)

It is better to summarize the model configurations in a table so that nothing would be missed (e.g. p2757, in Sec 3.1 the value of delt Hvap was not explicitly mentioned).

4. Adding auxiliary files containing data of fig 1-10.

Other people might benefit from these data when they try to quantitatively validate their coding of the model.



AMTD

2, C1165–C1167, 2010

5. The Thermodynamics equation for the temperature (in the TD) is not solved in this model. Since prescribed temperature and velocity profiles are used in this model, the author should clarify that any kinds of profiles could be specified. Using measurement profile data (e.g. Faulhaber et al., 2009) could largely reduced uncertainties caused by the assumed profile introduced in the manuscript . . .

6. Since Td has been defined in the paper, it is clearer to use this notation,

e.g p 2758, l 11: has been calculated at Td=Tref p 2771, figure: "temperature, Td . . ." p 2772, caption: ". . . at Td =25. . ."

Technical corrections:

7. p 2761, l17: comma is missing, ". . .for a fixed Csat, T50. .."

8. p 2761, l18: remove 'be', ". . . be best described ..."

9. Checking for consistence in Fig 3: MFR values (see below)

Fig3(a) (inset): 0.9<MFR<0.95 for dp=200 nm, aerosol mass loading=150 ug/m3, Csat=10 ug/m3, t_res= 15s;

Fig3(b): MFR<0.9 for dp=200 nm, aerosol mass loading=150 ug/m3, Csat=10 ug/m3, t_res= 15s

---

Interactive comment on Atmos. Meas. Tech. Discuss., 2, 2749, 2009.