

Interactive comment on “Kinetic model framework for aerosol and cloud surface chemistry and gas-particle interactions: Part 2 – exemplary practical applications and numerical simulations” by M. Ammann and U. Pöschl

Anonymous Referee #1

Received and published: 6 July 2005

The paper together with another paper “Part 1” tends to provide a general model framework for gas-particle interactions including chemistry. The concept is based on layered model with a sorption layer and quasi-static surface layer beside gas phase and bulk layers. The model comprises a set of rate equations to be solved in quasi-steady manner. Part 2 presents several examples on practical simulations. Honestly, I cannot say whether the model is universally thorough and provides a general basis for future works and experiment planning. I could say that the model is at least a good step towards

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a comprehensive model framework which is certainly needed. The problem with the papers is their length and style of presentation. I suggest the acceptance for the paper after I have got answers for the following and the paper is accordingly modified, and when Part 1 has been revised to the acceptable form:

1. Abstract and Introduction and Summary and Conclusions recycle the same blocks of text, for example 2nd and 3rd paragraphs in Abstract have many sentences which are reproduced in first 2 paras in Introduction; Intro and Summary must be completely rewritten.
2. Section 3, 2nd para: It is said that the plateaus illustrate the occurrence of quasi-steady-conditions in real time-dependent systems, however, the plateaus are calculated by the quasi-steady model, I feel that it is circular reasoning; see also Comment 5 in the review of the Part 1

Detailed/Technical comments:

1. Section 2.2.1: it is assumed that bulk diffusion is fast; since Table 1 also lists scenarios 2 with slower bulk diffusion, the difference between scenarios 1 and 2 should be clarified already in 2.2.1
2. Eq. 21 is quite self-explaining, that is fluxes (normalised by surface area) should be multiplied by the surface area and then divide by the volume to get volume-based concentration changes, but it could be explained explicitly
3. Fig. 15: the text (section 3.6, 2nd para) refers to Tables 1 and 3, but Fig. caption refers to Tables 2 and 3
4. Fig. 1: different curves should be explained in the caption, although they are labelled by the symbols

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5. Fig. 3: it said that particle surface composition and gas uptake coefficient are presented, although there is only one quantity (two curves for two scenarios)
6. Fig. 4: explain also in the caption the difference between Figs. 4–9, that is refer to Table 1
7. Figs. 11–13: refer to Table 2 in the caption
8. Fig. 14: Figs. a and b: the curves fill only small fraction of the Fig. area, rescale Y-axis
9. Table 1: replace “bulk diffusion” by “surface-bulk transport”, right?; explain in the caption different scenarios and the symbols
10. Tables 2 and 3: explain in the captions those symbols which are not explained in Table 1, refer to Table 1 for others

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 2193, 2005.

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