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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Modeling the chemical effects of ship exhaust in the cloud-free marine boundary layer" *by* R. von Glasow et al.

R. von Glasow et al.

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We are aware of the problematic definition of "soot" and know that carbonaceous particles that are emitted by ships are a mix of very different substances. We used the word "soot" as a generic word which we make clearer in the text now. Unfortunately there is a great lack of experimental data regarding the composition and concentrations of ship derived particles and reactions that occur very rapidly e.g. the mentioned condensation of organic vapors on other particles. We chose to distinguish between "partially soluble combustion particles" and "soot" based on the results of Hobbs et al. 2000 as discussed on page 533.

Particles that we call "soot" are chemically unimportant (with the properties that we specified) because of their low number concentration and very rapid dilution (even with the upper limits that we used). This is explained in length on page 546.

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We agree with Ulrich Pöschl regarding missing knowledge about heterogenous reactions, time dependences etc. As we state on page 535 the available laboratory studies show a large difference in reaction probabilities for different composition and time dependencies are not well known (see p. 536). This is why we chose upper limits from the literature. A more detailed discussion of these uncertainties is beyond the scope of our paper which is why we included so many references to laboratory work to enable the reader to follow up with questions like this.

Regarding his propositions:

ad 1)

We included this.

ad 2)

We did not follow this recommendation because we do use "accomodation coefficients" in the model. Heterogeneous reactions are treated like described in the cited literature (Sander and Crutzen, 1996, equations 11-14). We repeat this now on page 539. The use of the term accommodation coefficient is appropriate because that is how we include the kinetic data. It is also well-defined in the literature.

The use of effective uptake coefficients (γ) as accommodation coefficients (α) might lead to an underestimate of the overall loss rate. We tested this and found that the differences in loss rate coefficients were less than 1 %.

ad 3)

We added a short description how we calculate the rate coefficients and refer to the appropriate equations in Sander and Crutzen, 1996.

We want to stress that we agree in most points (especially the need for more data) with Ulrich Pöschl and want to thank him for this contribution.

Interactive comment on Atmos. Chem. Phys. Discuss., 2, 525, 2002.

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