Atmos. Chem. Phys. Discuss., 9, C383–C385, 2009
www.atmos-chem-phys-discuss.net/9/C383/2009/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Modelling multi-phase halogen chemistry in the remote marine boundary layer: investigation of the influence of aerosol size resolution on predicted gas- and condensed-phase chemistry" *by* D. Lowe et al.

Anonymous Referee #1

Received and published: 27 April 2009

This paper describes a sensitivity study of a combined size-resolved chemical/microphysical boxmodel focusing on variations in MBL chemical cycling across a set of size resolution and microphysical parameterizations. In general, this study represents a relevant investigation that considers how and to what degree chemical-vs-microphysical simplification schemes may impact model output with relevance to scaling 0-D models up to more complex and comprehensive multidimensional investigations. This is relevant to the current state of the science regarding multiphase atmospheric chemistry.

As a sensitivity study, the approach generates novel information useful in interpreting our current understanding of box model numerical approaches and, implicitly, the general context of previous and future studies of this sort.

In general there is one dominant issue with the paper: it is either difficult to interpret in a way that conclusions may be directly linked to the relevant results, or the conclusions are inappropriately drawn – though I believe it is the former.

References are given that point to a specific microphysical scheme, but there is - I believe - insufficient detail regarding the structure of the microphysics in a way that facilitates deconvolving the results. Is the primary focus of the microphysical model to calculate online mass transfer and aerosol lifetimes?

For example, there is some text indicating that particle moments evolve in time, but it is not said how beyond that particle formation and coagulation were not calculated (maybe it was described, but I couldn't manage to find it in several passes. If so, forgive me here.).

Also, perhaps a table detailing the set of runs conducted.

That being said, the content of the results section is in itself an interesting set of data. I am surprised to see such little difference, for example, in halogen mixing ratios between the bulk-turnover 1-bin model and the size-resolved turnover 16-bin. Our investigations demonstrated a more acute sensitivity of most of the gas-phase species to size-resolved turnover rates... though I suspect this would become far more clear were the descriptions of the microphysical processes more accessible. Is this difference because we conserve N/V rather than S/V? Do N/V and N/S show similar results in your case?

I guess in general, the conclusions say that if microphysical property X is important, it is important that it be conserved in any discretizing simplification. And while my "interpretation" may seem over-simplified, the results DO systematically support this

which is, ultimately, the proper goal of the science.

What would be helpful to see: If two scenarios demonstrate little difference (e.g. 16 v 1-bin), does this result hold up if, for example, the emissions of some centrally dominant species were different? Though, as the title says, it is a remote MBL study which suggests a constrained set of environmental/initialization parameters. What about in areas influenced by ship plumes, for example?

—— Nuts and bolts ——

8. Does the title clearly reflect the contents of the paper? Yes.

9. Does the abstract provide a concise and complete summary? It is quite clear and helpful in discerning the details of the text.

15. Is the amount and quality of supplementary material appropriate? Yes. Though, if length is an issue, perhaps the microphysical details could go here.

–> The tables and figure are well presented.

–> This work will directly benefit my own work and that of my colleagues.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 5289, 2009.