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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Global modeling of SOA: the use of different mechanisms for aqueous phase formation" *by* G. Lin et al.

Anonymous Referee #2

Received and published: 8 January 2014

In this manuscript, the authors use a global model framework to explore various SOA formation mechanisms in the aqueous phase. Detailed multiphase reaction schemes are compared to simpler surface-limited uptake processes. In addition, the effect of dissolved iron chemistry on aqSOA formation is investigated. Finally, the model results are compared to observations.

There are quite a few comparisons that the authors conduct in this study, but it is unclear what are the conclusions or the take-away messages. Which of their case studies would be closest to reality and should be incorporated in future models? I am not sure whether the comparisons that they make to the observations necessarily validate their model, they might be a little far-reaching. This paper presents good ideas of the different mechanisms of aqSOA formation that can be used in global models

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Interactive Discussion
Discussion Paper

and I think it would be most valuable if they could provide recommendations on why and which of these would be most "ideal" for future studies. For purposes of global modeling what parameters is aqSOA formation most sensitive to? Also, they should do a thorough read through again and try to make the language succinct and more clear.

Specific comments:

p.29632, l.2: thereby instead of there

p.29632, l.20: observed to "be" part of

p.29635, l.9: Did the authors mean formation "of" SOA instead of on?

p.29636, l.9: Can you include a source for using the value of 0.0029 as the uptake coefficient?

p.29636, l.10: Please elaborate on why this is the most realistic mechanism.

p.29636, l.17-21: Include a reference

p.29637, l.3-4: Should it be "are" instead of is, and "equations" instead of equation?

p.29637, l.22: What is the rationale behind using the value for gas diffusivity for all species?

p.29638, l.3-5: Can you elaborate on how the effective radius of the particles is calculated? Were any sensitivity calculations conducted for the cloud droplet radius? And what, if any, affect do the sizes used for the study have on the uptake rates?

p.29642, l. 2: add "the" before supplement

p.29642, l.3-7: Can you briefly describe the differences between the two models used for the cloud field output? And, why the AM3 is picked instead of others?

p.29642, l.17: Consider changing it to Results & Discussion

p.29642, l.21: missing word between shown and the

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p.29643, l.13-19: For comparison purposes, stay consistent with using exact values or percentages or both for all compounds discussed.

p.29644, l.3: “contributor” instead of contribution

p.29645, l.21: . . .and “for” oligomer concentrations instead of in

p.29647, l.7-8: Be consistent with using or not using the parenthesis for the references

p.29649, l.2: Could you compare the rates for oxalate destruction due to addition of iron chemistry and increase in SOA due to OH.

p.29650, l.4: Elaborate on the effect of iron chemistry on SOA formation in clouds vs aerosol water.

p.29650, l.7: Since there are a few different comparisons to observations in this section, a short introductory paragraph about what is being discussed and the relevance of these comparisons (simple clarifications like why compare oxalate, O/A ratios etc.) would help the flow of the manuscript. Somewhere in this section a brief discussion comparing the oxalate results to those from Myriokefalitakis et al. (2011) could be included.

P.29652, l.5: something missing in Florida Sydney?

p.29655, l.3-26: This discussion could be rephrased and rearranged as its easy to get lost in all the information. The ideas of organic hydroperoxides and organic nitrate are introduced without relaying their significance.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 29629, 2013.