Geosci. Model Dev. Discuss.,
https://doi.org/10.5194/gmd-2018-96-RC2, 2018

Geoscientific Model Development Discussions

Interactive comment on "libcloudph++ 1.1: aqueous phase chemistry extension of the Lagrangian cloud microphysics scheme" *by* Anna Jaruga and Hanna Pawlowska

Anonymous Referee #2

Received and published: 21 May 2018

The manuscript presents a new module to describe aqueous phase chemistry in a Lagrangian setup. While the simulation of sulfate formation in clouds does not represent any new development in cloud models, the fact that the new module was implemented in the previous 'superdroplet' framework. This framework can thus be applied to more complex chemical schemes in the future and will allow a computationally efficient implementation of such schemes. The manuscript is well written. I only have a few minor comments that should be addressed prior to acceptance.

p. 2, l. 1-6: This paragraph should be moved to the end of the introduction.

p. 2, l. 2: It should be also mentioned here that uptake processes between the gas

and aqueous phases are included. As it is, it reads that only aqueous phase chemistry is considered but the full multiphase system is implemented.

p. 2, l. 10: SO2 can be oxidized within minutes or a few hours within clouds.

p. 4, l. 8ff: A more detailed discussion of the errors would be useful to better appreciate the usefulness of your framework. How large are the statistical errors as compared to the numerical diffusion errors in previous schemes?

p. 5, l. 29, and throughout manuscript: deltaH/R are not 'correction coefficients'. They should be called 'temperature dependence' or 'enthalpy of ionization' (= only deltaH).

p. 7, l. 5, and throughout manuscript: The 'equilibrium dissolution constants' are commonly referred to as 'Henry's law constants'. Their temperature dependencies are 'enthalpy of solution'.

p. 7, l. 14: The sentence is not clear. Should it read 'This approach does ensure. . . the total dissolved mass. . .does not exceed'?

p. 7, l. 25: 'setup' misspelled

p. 7, l. 29: Add unit 'M' to [H+]

p. 7, l. 30: Why do you refer here to Table C2?

p. 9, l. 2, and throughout manuscript: 'water weighted average' might be misleading. I assume you mean '(water) volume weighted average'?

p. 9, l. 8, and throughout manuscript: I suggest using 'S(VI)' instead of H2SO4.

p. 15, l. 31: 'new aerosol particles' is misleading. It implies new particle formation. Please clarify.

p. 17, l. 7: minimize

p. 19, l. 7/8, and 14/15: These sentences sound awkward as SVI molecules are not oxidized. Try '92% of S(VI) originates from S(IV) oxidation by H2O2' (or similar).

p. 19, l. 20: Not clear what relative importance' refers to here.

Interactive comment on Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2018-96, 2018.