

Interactive comment on “An overview of current issues in the uptake of atmospheric trace gases by aerosols and clouds” by C. E. Kolb et al.

Anonymous Referee #3

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I commend the authors for a readable synthesis of the literature on this diverse area of heterogeneous chemistry and trace gas uptake to clouds and aerosols. The authors provide guidance to a broad audience on important ongoing issues therein and how best to move forward. The controversial topics, many of which remain unresolved, were treated in a balanced way- highlighting the confounding issues and discussing the reasons why such issues remain. The content is highly appropriate for this journal, and I recommend publication. My comments are fairly minor.

General Comments: I agree with other referees that an overview figure of the processes involved in uptake would be helpful to bring less familiar readers up to speed.

There seems to be an inconsistency among the use of Recommendations for Future Work sections – sections which I think are highly valuable. Some of the main topical

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discussions have recommendations that are embedded within the main topical discussion while some have an entirely separate section. I suggest each topical section is followed by a separate. “Recommendations for Future Work” section.

Recent field-based or “real – air” measurements of reactive uptake, e.g. of N₂O₅ and heterogeneous processing, both direct and indirect, get little mention here but provide important insights for designing future laboratory studies (Brown, et al Science 2006; Brown, et al JGR 2009, George, et al GRL 2008, Bertram, et al GRL 2009)

Minor Comments 11172, line 25 – Sentence starting Laaksonen . . . seems redundant
11173, line 1 – use of the word “real” in “. . .some other real suppression. . .” seems to imply that the films are not a real possibility.

11174, lines 5 – 25; Even if there is an enhancement in the net uptake due to enhanced surface reactivity, such modifications of bulk reactivity ultimately provide an upper-limit to the bulk accommodation process, no? I would think such limits are still potentially useful for constraining models. I agree if interpreted as a “typical” gamma value it can cause problems. My point is to perhaps also acknowledge such limiting information can be useful but needs to be incorporated with care.

In more than one location the word “that” appeared where it should be “than”, e.g. 11177 line 9

Starting line 18, 11178 – discussion suggests behavior of N₂O₅ uptake consistent with mass accommodation limitation – prior to and after this discussion the potential for surface reactions with H⁺, and halide ions are indicated as a potential modification to bulk accommodation. Is that not the case here because the observed rate remains the same in most cases, but products change?

11186 lines 14 – 17 not a sentence

11186 lines 18 – 19 some references should be provided here

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11186 lines 24 on, an entire discussion of H₂O₂ uptake seems to be missing, did the authors mean HO₂ here?

11195 lines 13 – 24. The language here about aerosol flow tubes seems inconsistent with what follows where it is rather strongly recommended that aerosol flow tubes be used to study mineral dust particles in future experiments. I don't recommend making conclusions about what reactions can and cannot be studied in one apparatus as opposed to another. Each apparatus (flow reactor, static chamber, Knudsen, etc) has limitations that can or cannot be overcome depending on the instrumentation (accuracy and precision), creativity of the user, problem being studied, etc.

11196, lines 10 and on. Initially, I thought the authors were going to avoid discussing the actual kinetics, gammas, etc. This discussion should not be in a section entitled "outstanding issues and future work". At the very least the word "kinetics" should appear somewhere in the title to that section. This comment is also related to the general comment above about the "future work" sections not being consistent in scope or content. I suggest separating the review of the kinetics followed by a section on recommendations for future work.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 11139, 2010.

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