Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2017-458-RC1, 2017

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Heterogeneous reactions of mineral dust aerosol: implications for tropospheric oxidation capacity" *by* Mingjin Tang et al.

Anonymous Referee #3

Received and published: 18 July 2017

This is a very interesting review focusing on the heterogeneous reactions of mineral dust aerosol with trace gases in the atmosphere. It presents a comprehensive and critical review of laboratory studies of heterogeneous uptake of OH, NO3, O3, and related species by mineral dust. The point of view which has been chosen here i.e., assessing the importance of the heterogeneous processes by comparing the associated lifetimes with other major loss processes and by discussing relevant field and modelling studies is very interesting and brings real added-value to already published reviews.

I really enjoyed reading this manuscript and would therefore recommend its publication in Atmospheric Chemistry and Physics. I have only one comment on which I would like

to draw the authors' attention to.

As one of the major target of that review is to derive lifetimes associated to heterogeneous processes, which is a valuable information, I would encourage the authors to put more emphasis on the needed/missing input information and more specifically on the need to use uptake coefficient derived under steady state conditions. Clearly this point is already more or less addressed in this review but without being properly emphasized. I believe that devoting a full paragraph to this issue in section 1.2 ("Introduction to heterogeneous kinetics") would be the way to go, and then for every targeted compound to highlight what is known and unknown with respect to long exposure times (i.e., steady state conditions), as initial uptake coefficients should not be used to derive atmospheric lifetimes for mineral dusts.

Also, when the authors derive these lifetimes, they fix one gas phase concentration and then do the calculations. However, for many of the processes discussed here, the lifetime will change with concentration and therefore the associated lifetimes will be spatially different. For instance, an uptake process could be slow at high concentration (i.e., at ground level) but significantly faster under reduced concentration (i.e., at higher altitude). Maybe the authors could bear that in mind when assessing lifetimes for some of the compounds, and especially ozone.

Minor points

The introduction, and justification of that review, is maybe a bit lengthy and could be reduced without loss of information.

The simplified figure 1 is still somewhat difficult to follow.

Why plotting the uptake coefficient versus the gas phase concentration on log-log scale (e.g., figure 13)? Is there a justifications for that? There are different ways of linearizing the adsorption isotherms and extract meaningful information.

2017.

C3