Referee 1

General comment

This manuscript presents the IUPAC Kinetics Subcommittee's most recent review and evaluation of gaseous species uptake and selected surface reaction kinetics on solid atmospheric particle surfaces, specifically water ice, sulfuric and nitric acid hydrates, and mineral surfaces. It consists of a valuable introductory review of the chemical and physical processes pertinent to the heterogeneous processes of interest, a discussion of condensed phase atmospheric particle and droplet surfaces, a large number of data sheets for specific trace gas uptake/surface reaction processes and summary tables of recommended parameters for the processes reviewed. This material was posted on the IUPAC web site in 2009. I did not review every data sheet, but I did read enough to ascertain that they are generally well-organized, clearly written, suitably referenced and present reasonable "preferred values." To some significant extent data missed or misinterpreted in this type of review are partially self-corrective because the authors of the original literature cited, as well as authors of studies that might have been missed often check the relevant evaluations and notify the authors about any problems they perceive. This community review feature occurs for the web posted evaluations and is also obvious in the comments posted about this APCD manuscript.

This manuscript represents an enormous amount of effort spent on accumulating and organizing previously published data, followed by insightful evaluation and systematic presentation. It provides information that will be very helpful to scientists interested in modeling atmospheric composition and its impact on meteorological, climate and radiation transport properties, as well as, human heath and ecosystem vitality effects, scientists who design and perform, atmospheric measurements and scientists who investigate fundamental heterogeneous processes involving atmospherically relevant surfaces and gaseous species. It should be formally published in an accessible format, like ACP, as well as presented on the IUPAC subcommittee's web site. I recommend publication after the authors have considered and dealt with the technical, organizational and copy-editing issues listed below.

Reply

None required

Comment 1

As presented the manuscript presents Appendix A1 Summary Sheets right after a one page Introduction. This means that the parameter symbols have not yet been defined, which is not acceptable. I suggest that these Summary Sheets be moved to the end of report narrative, past Table 1, where they are defined.

Reply

The present format is that of all the IUPAC publications in ACP to date, the summary tables always preceding the text describing the parameters listed and their usage. We shall add footnotes to each table indicating the meaning of each parameter, but will keep the lengthy guide to the datasheets in its present position.

Comment 2

The Summary sheets presented (as well as the data sheets) are designated Appendix A1, Appendix A2, AppendixA4 and Appendix A5. I suspect Appendix A3 was supposed to be about soot uptake, but it was deleted, apparently without bothering to renumber. This is likely to be pretty confusing to readers.

Reply

The lack of Appendix 3 is related to a requirement to keep the datasheet numbering on the IUPAC web-site and the publications in ACP consistent. An Appendix 3 with text to explain the situation will be added to the revised manuscript. (Discussed with the editorial office).

Comment 3

Section 2 Guide to the data sheets: 1st paragraph, 1st sentence – "heterogeneous" not "Heterogeneous"; 2nd paragraph, 2nd line – delete "soot", since the soot data sheets are not included;

Agreed, these corrections will be made.

3rd paragraph, 5th line – "liquid droplet" not "liquid aerosol" (an aerosol is an ensemble of gas and suspended liquid drops and/or solid particles – it is increasingly incorrectly used to mean "aerosol particle", "aerosol droplet" or "aerosol particulate matter (PM)." There are other instances of this common misuse, e.g. twice in section 4.2.3.

Reply

Agreed, these corrections will be made.

Comment 4

Section 3 Description of Heterogeneous Kinetics: Equations (1), (5) and (7) – the symbol "=c" used to delineate the mean gas thermal velocity is unwieldy and con fusing. The heterogeneous kinetics community almost solely uses ; this manuscript should too.

Reply

We actually use the symbol $\bar{c}$. The =c is likely the result of a latex incompatibility problem and will be dealt with in revision.

Comment 5

Section 4 Surface Types Considered: The descriptions of soot (4.1.4), solid inorganic salt particle (4.1.5), and the three types of liquid surfaces presented in Subsection 4.2 are not really pertinent to this manuscript and probably should be reserved for presentation in subsequent evaluations that actually present data for gaseous uptake by these surfaces.

Reply

Agreed, these corrections will be made

Comment 6

Table 1 (page 5264) the symbol for the surface accommodation coefficient is shown as _rms, however, it is shown as _s in subsection 3.5.1 and Equations 18 and 19.

Reply

The correct symbol is α_s . This will be corrected in revision.

Comment 7

Introduction References – Abbatt, J.P.D.; Interactions: : :, not "INteractions" also capitalize "gases"; Jedolovszky, P., : : :: : :: : :.Determination of: : :, not "Determination od." This is just from quick inspection – the references need to be carefully proofed.

Reply

The references will be carefully proofed and corrected in revision.

Comment 8

Data Table Comments – I appreciate the "Reliability" estimates for the "Preferred values, but I wonder about what they mean when the Preferred value is listed as a limit, particularly an upper limit. This needs some thought, and probably an explanation if you want to quantify the reliability of a limit with an absolute value.

Reply

Agreed, reliabilities will not be given for upper / lower limits