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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Ice nucleation efficiency of clay minerals in the immersion mode" *by* V. Pinti et al.

V. Pinti et al.

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We thank Reviewer 1 for the helpful suggestions and comments. Below are detailed answers (in italic).

V. Pinti, C. Marcolli, B. Zobrist, C. R. Hoyle, and T. Peter have undertaken a differentialscanning calorimetry study of a number of often-used mineral dusts and one whichI have not seen specifically used from a mountain region in the Sahara. Heterogeneousnucleation behavior is observed and a bi-modal structure is taken to be a smallpopulation of very good ice nuclei and a more common population that nucleates at asomewhat lower temperature. Overall this is a solid study of ice nucleation that largelyagrees with the previous literature but also modestly expands upon it. It is therefore myopinion it is suitable for publication in ACP with some minor revisions.

The use of the terms "special" and "best" for the aforementioned nucleation peaksis rather awkward. Specifically, it isn't clear what "special" or "best" really refers toand neither is a descriptive scientific term; my suggestion would be use of a moredescriptive term such as "highest temperature", etc. (this for both the peak and theactive sites). To be clear, I'm not so much concerned with what the final choice in words is but just that something descriptive and not subjective is used.

We agree with the reviewer that the terms to describe the different types of sites should be descriptive and not subjective. However, we do not consider "special" and "best" as subjective. The term "special" should highlight that these peaks do not occur in all qualities of the same clay mineral. We could not think of another term that describes this aspect better. We think that "best sites" implies in an intuitive way that these sites cause freezing at the high temperature end of the nucleationspectrum of a material. "highest temperature sites" would be quite long and therefore rather awkward.

I suggest that the sentence "We suggest that apparently contradictory results obtainedby different groups with different setups can indeed be brought into good agreementwhen only clay minerals of the same type and amount per droplet are compared."should be reworded. Specifically, there are many experiments that only look at a singleice nucleus whereas these authors use a technique that can include more. Since asingle ice nucleus is the atmospherically relevant condition what the authors shouldbe suggesting is that their data need to be interpreted in the context of a single icenucleus, not that more atmospherically relevant experiments be changed (the appropriaterewording is to suggest that those experiments that use multiple IN need to beinterpreted as such; as it stands now it reads the other way around).

We reworded this sentence the following way in the revised manuscript:

'Apparently contradictory results obtainedby different groups with different setups are indeed in good agreementwhen only freezing experiments with clay minerals of the same type and amount per droplet are compared.'

Reference on dust loading from IPCC 2001 should be updated to a more recent reference(i.e., IPCC 2007 or other).

We changed it accordingly.

While the DSC apparatus has a history for these types of studies there needs to bea line in the Experimental section that notes that the emulsion material is not whatone would find in the atmosphere surrounding a particle but that it is believed to noteffect the results. This is done but not until the results section on page 12 which iscounterintuitive.

We added a sentence to this in the experimental section.

A reference to this effect would also be warranted (I assume this issuewas not in question until this manuscript?).

We added in the experimental section a reference to page 12.

The "Clays" section is somewhat too long. There is extensive literature on the dustsand much of this information is best left as a reference. The Hoggar section is noveland should be left as is.

We shortened the "Clays" section slightly. However, much of the informationrefers to the specific characteristics of the different clay minerals. These aspects are important for the following discussion about the different freezing behavior of different qualities of the same clay minerals.

Itis a bit strange that a new name (Ahaggar) is presented for the Hoggar samples onpage 8 and then again on 11. Much as for an acronym this should be moved to the firstcall of the name and then use one or the other throughout.

We changed this accordingly

BET needs to be defined at first use (page 13)

We added this information accordingly.

The second paragraph of the Discussion section is rather awkward and needs a rewrite. The authors quickly go through BET, classical nucleation theory, contact angles, andsingular theory without really explaining any concept. Please clearly define the differentattempts to interpret the data and then show if the fit is good or not. The paragraphtoo quickly goes through multiple concepts known only to the expert in this area. Moredetail can then be given in the next paragraphs.

We reworded this paragraph.

Despite these minor issues this is a well written paper of interest to the ACP communityand one worth publishing.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 3213, 2012.