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Comment

Interactive comment on “Deposition mode ice nucleation reexamined at temperatures below 200 K” by E. S. Thomson et al.

Anonymous Referee #2

Received and published: 13 October 2014

The paper presents low-temperature (155 K - 200 K) results on heterogeneous deposition mode ice nucleation on several surfaces. While the temperature range in the study is too low to be of direct interest to most atmospheric research, the discrepancy between the data and existing macroscopic theories shows a clear need for further research in the microphysical understanding of nucleation, therefore addressing scientific questions relevant for the journal. The paper presents the results clearly and includes valuable, thorough discussion of the interpretation of the data in comparison to earlier work, and of the details and problems of macroscopic models compared to the data. Discussion of relevance to atmospheric temperatures, promised both in the abstract and in the title of section, is largely missing, however.

In Figure 2 caption a note should be added to clarify that the dashed line is for ho-
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mogeneous ice nucleation from solution, currently its interpretation is not clear without reading the main text.

In Figure 3 and the related text authors state that apart from a scaling factor, homogeneous nucleation theory gives a good match with data for critical supersaturation values. Comparison to predictions of heterogeneous CNT (without a near-perfect fitting due to a varying contact parameter) are difficult, however, since no similar log plot is made for that. Authors should add a plot of heterogeneous curve to this figure, with similar scaling as for experimental data, assuming a constant contact angle, as in Fig. 5 for graphite.

Correspondingly, please comment how would a simpler model for heterogeneous nucleation, adding only a single contact angle term (as in Loeffler&Chen, JCP 139, 234707 (2013)) to the homogeneous nucleation equation for free energy, perform in a similar comparison?

Figure 6: It would clear the message and make it more in line with the corresponding text, if caption of Fig. 6 would include a sentence like: "However, the contact angles derived from these fits do not seem physical." Currently a quick reader would mainly get a message that CNT fits the data nicely and clearly explains everything well. Additionally, there is a typo "preforms" in the last sentence.

Page 23726, row 12: I would replace the words "can be well explained" with "can be replicated" or similar to avoid the interpretation that CNT would give an accurate explanation of the physical process.

Explicit discussion of the relevance of results for higher temperatures should be added.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 23711, 2014.

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