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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Contact freezing: a review" *by* L. A. Ladino et al.

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This is a timely and rigorous examination of contact versus immersion freezing modes of ice nucleation as found from laboratory experiments. I completely agree with its publication in ACP. The article gave me a lot to think about. My main comment is that it should repeatedly emphasize that the work reported in the article is based on laboratory experiments (and this should be indicated in the title). My general and specific comments are given below.

General Comments

It is essential that you indicate in the title and in the body of the text that this article represents laboratory observations (e. g., 7816 lines 10 and 12, "experimental" to "laboratory").

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There are a lot of imprecise statements made. For example, Pg. 7816, 16, “understand the role of contact freezing in cloud formation and climate”. Its unclear how contact nucleation has a role in cloud formation.

Pg. 7212, Abstract, last line and Conclusions. What is clearly needed is to conduct laboratory and field studies to identify the conditions where contact nucleation does occur in real, natural-cloud conditions.

Pg. 7812, last sentence. I want to see a reference here otherwise modify the statement.

7813, 19. Some mention of secondary ice should be at least stated.

Section 2.3.1 on IN solubility could be more likely with immersion than contact freezing, wouldn’t it be?

7185, 17. But at least in most convective clouds, this is at temperatures much warmer than 0C so contact nucleation would be secondary to immersion freezing.

7815, 21-22. How and what did they find?

Conclusions: What is clearly needed are field observations in natural clouds to identify candidate contact freezing events or situations. What I think should be done is to look at dust-laden clouds as was done in the NAMMA field experiment and is proposed for the ICE-D experiment. The idea would be to fly just below cloud base, then just above, then step up from that height to 0C and to measure and quantify the size distribution of the interstitial aerosols to indeed see what is actually there to assess whether and where contact nucleation is a possible process.

Specific Comments

7812, Line 5, 7815, 14 and 7840, 4. “highest” to “warmest”.

7812, 22. “catalyze” to “initiate”

7816, 6. “cloud formation” to “ice in clouds”.

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7824, 18. “primarily focuses” to “primarily focusing”.

7833, 6. “calculated/reported” to “calculate/report”.

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/13/C2298/2013/acpd-13-C2298-2013-supplement.pdf

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 7811, 2013.