

Interactive comment on “The Leipzig Cloud Interaction Simulator (LACIS): operating principle and theoretical studies concerning homogeneous and heterogeneous ice nucleation” by S. Hartmann et al.

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My first comments of a few days ago contained an error. I mistakenly referred to equation (11) of the manuscript as representing the singular model. Yet, the remark would have been correct if it had referred to equation (11) of the closely linked paper by Niedermeier et al. (2009) and this explains the rest of the paragraph in my comments. More specifically, when the exponents of the two equations (11) are compared, using constants cited in the two papers for ATD and for the temperature range $235\text{K} < T < 239\text{K}$, it is found that the difference is quite small. The two curves have similar shapes

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and the ratio of highest to lowest value is near 5 in both cases. Thus, the general point to be made is that when the results of experiments in which temperature is lowered at a fixed rate are compared with the stochastic and singular models, both formulated with adjustable parameters, no clear distinction can be established between the two predictions. Only with experiments in which tests are made with different cooling rates can it be ascertained that the stochastic model fails. Such variations in operating conditions are not easily achieved with continuous flow and expansion chamber instruments. The foregoing point does not impact the distinction established in the Hartmann et al. manuscript between homogeneous and heterogeneous nucleation events.

In general, we agree with the referee, see also response on comment 1.

One of the main conclusions in (Niedermeier et al., 2010) is that without changing further parameters such as ice nucleation time and seed particle size singular and stochastic model based parameterizations explain the experiments similarly. Investigating the influence of these parameters on the freezing behavior is an important issue for further experimental and theoretical investigations at LACIS.

References

Niedermeier, D., Hartmann, S., Shaw, R. A., Covert, D., Mentel, T. F., Schneider, J., Poulain, L., Reitz, P., Spindler, C., Clauss, T., Kiselev, A., Hallbauer, E., Wex, H., Mildenerger, K., and Stratmann, F.: Heterogeneous freezing of droplets with immersed mineral dust particles — measurements and parameterization, *Atmos. Chem. Phys.*, 10, 3601–3614, doi:10.5194/acp-10-3601-2010, 2010.

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