

Interactive comment on “A pyroelectric thermal sensor for automated ice nucleation detection” by Fred Cook et al.

Anonymous Referee #2

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This manuscript by Cook et al. describes a new method for monitoring the freezing temperatures of microlitre water droplets using a pyroelectric polymer film sensor. The approach described is, to the best of my knowledge, new and would certainly be useful to the many researchers using these sorts of assays. The manuscript is very well written and presented and should be published. I have a few minor suggestions which the authors may wish to consider. These mostly align with the changes recommended in the two referee comments already posted.

Minor comments: The most important change to my mind would be some discussion of the likely limitations of the approach. This would be helpful for anyone looking to adapt pyroelectric sensors to other droplet freezing instruments or sample types. Specifically, some estimate of minimum droplet size and minimum supercooling (or combinations

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thereof) that could be detected would be of interest. For instance, could this instrument reliably pick out freezing of microlitre droplets at around -2°C as can be induced by Snomax? (Wex et al., 2015) In this scenario the temperature change on freezing would be less than in the datasets presented and the freezing events would occur at much smaller time intervals.

My view is that the rates presented are better described as freezing rates rather than nucleation rates (Vali et al., 2015). Also, the nucleation rate is not derived from classical nucleation theory as stated in the caption to Fig. 5. Classical nucleation theory could be used to describe the nucleation rate but is not needed for calculating rates from experimental data.

As mentioned by the other referees a little more discussion of the nature of the samples and of the preparation of the glass samples would be of useful.

Vali, G., DeMott, P. J., Möhler, O., and Whale, T. F.: Technical Note: A proposal for ice nucleation terminology, *Atmos. Chem. Phys.*, 15, 10263–10270, 10.5194/acp-15-10263-2015, 2015. Wex, H., Augustin-Bauditz, S., Boose, Y., Budke, C., Curtius, J., Diehl, K., Dreyer, A., Frank, F., Hartmann, S., Hiranuma, N., Jantsch, E., Kanji, Z. A., Kiselev, A., Koop, T., Möhler, O., Niedermeier, D., Nillius, B., Rösch, M., Rose, D., Schmidt, C., Steinke, I., and Stratmann, F.: Intercomparing different devices for the investigation of ice nucleating particles using Snomax[®] as test substance, *Atmos. Chem. Phys.*, 15, 1463–1485, 10.5194/acp-15-1463-2015, 2015.

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