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

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The manuscript describes proof-of-concept experiments using a pyroelectric sensor to detect ice nucleation events in a conventional cold plate instrument. This is, to my knowledge, the first time this type of sensor has been used in this type of instrument. Discussion of other instrumental techniques and their advantages and drawbacks is reasonable and complete. The experiments are brief but reasonable, allowing for comparison with data from different instruments and producing some novel data. The manuscript is publishable, but would be much improved if several specific comments below are addressed.

Specific Comments:

1) Lines 170-180, sample preparation: More details should be included on the process for making the glassy sample: temperatures used, quench process, milling size, any characterization of final material.

2) Lines 170-180: Feldspar materials can weather in aqueous solution, especially when acidic. This may be particularly important for ice nucleation, which depends on the structure of the mineral surface. A brief discussion of this is perhaps warranted, given that samples were stored suspended for up to a week. The glassy samples may also weather differently from the crystalline one. See refs:

Lee, M. R. & Parsons, I. Microtextural controls of weathering of perthitic alkali feldspars. Geochimica et Cosmochimica Acta 59, 4465–4488 (1995). https://doi.org/10.1016/0016-7037(95)00255-X

Lee, M. R., Hodson, M. E. & Parsons, I. The role of intragranular microtextures and microstructures in chemical and mechanical weathering: direct comparisons of experimentally and naturally weathered alkali feldspars. Geochimica et Cosmochimica Acta 62, 2771–2788 (1998). https://doi.org/10.1016/S0016-7037(98)00200-2

3) Paragraph around line 180: It doesn't appear that stochastic/binomial errors in n(T) were considered for the error estimates, which is the conventional way of doing this analysis and is almost always the dominant source of error. This should be remedied. A "score confidence interval" is the best approach at low numbers of freezing events. Justification for this, as well as equations for the calculation (eq. 2), can be found in:

Agresti, A. & Coull, B. A. Approximate Is Better than 'Exact' for Interval Estimation of Binomial Proportions. The American Statistician 52, 119–126 (1998). https://doi.org/10.2307/2685469

4) Due to the low mass fractions used in the solutions under study, effects noted in the following paper may become significant Although I believe good overlap in ns values (as shown in this manuscript) is an indication that corrections are not necessary:

Beydoun, H., Polen, M. & Sullivan, R. C. Effect of particle surface area on ice active site densities retrieved from droplet freezing spectra. Atmospheric Chemistry and Physics 16, 13359–13378 (2016). https://doi.org/10.5194/acp-16-13359-2016

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