

## ***Interactive comment on “Revisiting the differential freezing nucleus spectra derived from drop freezing experiments; methods of calculation, applications and confidence limits” by Gabor Vali et al.***

### **Anonymous Referee #1**

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This is a well-written manuscript. The topic of the evaluation of different freezing nucleus spectra fits perfectly well into the journal AMT. The author revisits his own publications from 1971, 2008, and 2014. He develops enhanced methods of calculation, application, and confidence levels of freezing spectra from drop freezing experiments. The paper is very timely and the whole community of ice nucleation research will benefit from this paper which should be published after some minor corrections.

At the beginning of the paper the author should discuss in more detail the advantages to plot nucleation spectra as  $k(T)$  or  $K(T)$  functions and might compare with alternative

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concepts. Many colleagues use  $n_s$ , which is the site density. However, the cumulative concentration has many advantages over  $n_s$ , which might be discussed. In particular,  $n_s$  requires the specific surface area, which, e.g. in the case of soluble, macromolecular INP cannot be determined but requires suspendable, solid INP. Also, the specific surface area determined in gas phase can be rather different from  $n_s$  in aqueous phase. Also in the cumulative functions there can be an impact, when the normalization factor  $X$  is chosen, which can be normalization to unit volume, unit mass or unit surface of INP. The latter should be clarified and examples could be given, such as cellulose, which is even changing its freezing behavior from one freeze-thawing cycle to another, probably related with a change of specific surface area (water-cellulose interface).

Another interesting topic is the background correction. In figure 6, in the corrected differential spectrum a signal between  $-10^\circ\text{C}$  and  $-17^\circ\text{C}$  arises, which is probably related to the biological material in soil. This should be discussed in more detail, because it underlines the value and the significance of the whole method.

Minor corrections

P1, l15 and p2, l26: INP has already been defined in p1, l10 and doesn't need definition again.

P3, l1-2: "In practice, several runs with the same sample may be combined to accumulate a sufficiently large sample size No for useful statistical validity of the results." Add explanation. Repeated measurements might cause problems (see cellulose, comments above).

P4, l15: "Eqs. (1) of (2)" should be "Eq. (1) instead of (2)"

Fig. 3: The label of the left y-axis should be blue

Fig. 4: The label of the y-axis is not clear, use color code.

Fig. 5: Add "distilled water" to the label of the "control" curve

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Fig. 6: Add “distilled water” to the label of the “control” curve

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Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2018-309, 2018.