

Review of Pummer et al.: Ice nucleation by water-soluble macromolecules

First of all I am satisfied that the authors have gone to a lot of effort to address my earlier comments, which centred around making the manuscript clearer and less like a review article in places. The review has been a useful process and clarified many aspects of the paper. There are sections that contain a lot of detailed methods. This makes for a difficult read in places, but nevertheless some readers will find it useful. I have a few remaining comments below. The key one is the last specific comment, which may help put biological particles into context, although I may have misinterpreted the findings.

General

- Abstract: much improved. However, can it be stated what the findings from the paper are? i.e. you mention you provide new data, but maybe it would be more substantive to say something like, “we argue that our data support this view of ice nucleation by macromolecules”? I am just thinking of some statement to link your paper to the data you’ve collected.
- Throughout: quite a few typos, grammar issues that should get picked up by copyediting.
- In my opinion the discussion could be stronger. For example on line 27 of page 43 you state that contact angle is a macroscopic interpretation, but don’t really develop this any further. You also state in several places that you want to develop a more molecular view of ice nucleation, but it is not clear what you mean by this. After all you are still using an n_m approach, which is not really specific to a molecular view. The discussion then ends with some very speculative ideas.

Specific

- Introduction: in reference to figure 1 you describe 1c as heterogeneous ice nucleation on an anti-freeze protein. I must be missing something subtle here. I would have thought anti-freeze inhibited ice nucleation. You also use the acronym BINMS in the figure, but the definition has been removed from the intro now.
- The introduction ends rather abruptly with reference to a table and no discussion of it. I think a sentence to lead into the next section would make the text flow better.
- “some low-molecular organic compounds”? Not sure what is meant here
- When discussing the atmospheric implications I was wondering if you are able to put your measurements into perspective. It seems that the highest n_m measured is about 10^{13} kg^{-1} , which when multiplied by the size of a typical IN $\sim 1 \times 10^5 \text{ kDa}$ as an upper estimate (or about $1.6 \times 10^{-19} \text{ kg}$) is 1×10^{-6} . Does this mean that only 1 in 10^6 of these particles would be IN?