

Review of Worringen et al. 2015:

This paper focuses on three different techniques to sample ice nucleating particles and ice particle residuals during the INUIT field campaign. The comparison of these techniques is valuable and enables a better understanding of the limitations of these techniques, while also highlighting the large amount of information that can be learned about ice nuclei using these techniques. The results, and particularly the differences in results between the various techniques, were interesting and are an important contribution to the body of literature on ice nucleation.

This paper is greatly improved. It was much easier to read and the beginning is less repetitive. However, section 4 is still very repetitive and could use some smoothing and revision. Additionally, all of the discussion about previous results is nice, but more discussion on how the present results add to the literature and what is new and special about them is necessary. What does the reader learn from the comparison? What is the take home message? Due to these concerns, I would recommend this for publication after minor revisions.

General Comments:

Some abbreviations and acronyms are defined multiple times or after the second or third use of the term. Please define the acronyms only once and at the first instance of use.

As noted above, section 4 is repetitive and needs to be revised to be more concise.

Percentages of different particle classes should have uncertainties associated with them and how the uncertainties were calculated should be included in the Experimental section.

Specific Comments:

Abstract:

“In addition, considerable amounts of soluble material occurred.” Replace “occurred” with “were observed”.

The name of the field study should be added to the abstract where the author mentions it is joint field campaign.

Introduction:

“Though there has been an advance during the last decades, in particular for aerosol-cloud-interactions...” Replace “has been an advance” with “have been advances”.

“During the last decade, several techniques emerged which are capable to distinguish...” Replace “to distinguish” with “of distinguishing”.

Experimental:

The product information is given for the TEM grids but not the boron substrates. Please include this product info, as well as the OPC product info.

“The freezing temperature during the campaign was slightly...” Be clear that this is the instrument operating/freezing temperature. It is not entirely clear with this wording.

“The ice supersaturation was varied between 1.14 and 1.80...” Please add percentage signs after the supersaturation percentages. Also, if the ice saturation was in the stated ranges, then the ice chamber was operating in the deposition mode. This was not mentioned anywhere in the article. Be clear, especially when comparing to previous results, that you are comparing to deposition nucleation.

“A virtual impactor downstream the inlet...” Add “of” between “downstream” and “the inlet”.

It is mentioned that both TEM grids and boron substrates were used, but it is not clear why both were used or if certain conditions warranted one or the other. Please explain why both were used.

The HYSPLIT trajectories are mentioned, but the reader is not directed to the supplement to find them. Please add that they are located in the supplement.

Results:

The Pb-containing particle discussion is great, but the end of it is quite repetitive. Please make it more concise.

“During this time, higher black carbon concentrations were measured than during the earlier periods (not shown).” What is not shown? Black carbon concentrations? What instrument was used to measure this and why isn’t it shown? Is there another paper you can cite that includes this information?

It is suggested that the sea salt and sulfate particles observed, especially while sampling with the Ice-CVI, are potential sampling artifacts. Is it possible that the sea salt could have been from rimed droplets that got sampled through the Ice-CVI and dried down to show salt particles and whatever the original IN was in the cloud?

It is mentioned that more internally mixed particles are observed with the FINCH+IN-PCVI technique, but there is no discussion on why this might be the case. Could it be due to mixing in cloud, followed by drying down to form internally mixed particles that are then sampled and re-activated in the FINCH? Are there any differences in how the cloud particles are dried in the different techniques?

“In previous IPR measurements at the JFJ station, Pb-bearing particles were found at high abundance.” Remind the reader which technique was used in the past measurements in the text.

In section 4.1.1, there is a lot of discussion about previous results. It is mentioned for some if they are from laboratory or field measurements, but not for all. Please be clear about which results are from field measurements and which are from laboratory studies. The temperature range and nucleation mode would also be useful in the discussion to fully understand the comparisons.

It is mentioned that artifacts were identified and can be avoided in the future. How? There is no mention of how these artifacts can be avoided. Either add discussion on how to avoid the artifacts or revise to say they can be readily identified.