

Interactive comment on “Annual variability of ice nucleating particle concentrations at different Arctic locations” by Heike Wex et al.

Anonymous Referee #1

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General comments The manuscript presents longer term observations of INP concentrations at four Arctic stations. These are then discussed in the context of chemical compounds, back trajectories, and previously published data. The results are interesting, approach and methods are sound. The text is mostly clear but should be more concise. In particular the Introduction section has some lengths. I also wonder what the storage and transport histories of the samples from the field stations to the laboratory are meant to tell us. Atmospheric INP that could perish at room temperature would probably do so within a short time, perhaps already during a sampling period of several days. I can not imagine why it would help to freeze them again at a later stage. Possibly, many INP found in the atmosphere, even biogenic INP, can well be stored when dry at room temperature for many years (see Vasebi et al., 2019,

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<https://www.biogeosciences-discuss.net/bg-2018-496/#discussion>).

The comparison of INP concentrations with chemical compounds in the same of air masses revealed no correlation. The discussion of that finding does not go much beyond current understanding, so it could be shortened substantially.

The back trajectory analysis to illuminate possible changes in source regions to explain observed increases in INP during spring or summer is original. I wonder how much the results of this analysis depend on the fact that a trajectory model was employed and not a particle dispersion model, in particular the results related to Utqiagvik.

The first part of section 3.3 (Determination of possible source regions; page 9, lines 5-33) should be moved into the Methods section.

Section 4 (comparison with literature) could be reduced in order to avoid repetition of what has been said already in the Introduction (or vice versa).

The Conclusion section would benefit from a couple of sentences relating back to the potential influence of INP on Arctic clouds stated in the Introduction. Do concentrations observed at any of the four stations fluctuate between concentrations that would have different effects on clouds?

Specific comments

Page 2, lines 13-15: “Not many measurements . . . exist . . .” Either say that “measurements ...were done” or that “data . . . exist”).

Site description: Please indicate the altitude of all four stations.

Page 5, line 6: “. . .the volume of air sampled per 1 mm piece of filter was roughly 270 or 540 L.” Does this mean that you are not sure about the sample volume?

Page 8, lines 29-31: “. . .and therefore might be indicative of biogenic material. This might point towards a direction in which more detailed studies could be undertaken in the future.” I wonder what substance is left of a thought after qualifying it with two

“might” and one “could”.

Page 11, lines 29-30: “. . .N(INP) in the Arctic may, at times, be lower than at other locations.” This statement probably applies to any location on Earth, except, if there is a location where N(INP) is always the global minimum N(INP).

Page 12, lines 30-31: “PNSD measured on ground and in heights up 1200 m generally agreed, . . .” Agreed on what? Or, do you mean “were similar”?

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2018-1274>, 2018.

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