

Response to the Comments of Reviewer 2

We would like to thank Reviewer 2 for the positive assessment and their comments. We reply to the individual comments below.

General comment *The authors provide an overview of ship based INP measurements spanning from the Arctic to the Southern Ocean. Measurements were conducted using droplet freezing techniques and continuous flow diffusion chambers allowing to assess a wide range of freezing temperatures. Additionally, attention is paid to potential influences of ship stack emissions on the INP counts; a relevant information for the analyzed data and planning for future ship based INP measurements. What makes this manuscript particularly valuable is that the authors include literature reported data points for various measurement locations. Thus, providing an overview of to date available marine INP measurements which the field can build up on to improve the understanding of the relevance of these INP types. The manuscript is very well organised and well written. I recommend publishing this manuscript after addressing the following comments:*

Specific comments

Section 3 titled 'Worldwide coverage of maritime observations' needs to also include literature which reported INP measurements in marine environments but is not included in the data analysis presented in this manuscript. The manuscript and particularly section 3 appear as an overview of INP measurements done to date in maritime environments and with this should include all relevant literature e.g. I noticed the following references are missing for this section:

- (1) Irish et al. Ice Nucleating Particles in the Marine Boundary Layer in the Canadian Arctic during Summer 2014. Atmos. Chem. Phys. 2019, 19 (2), 10271039. <https://doi.org/10.5194/acp-19-1027-2019>.*
- (2) Irish et al. Revisiting Properties and Concentrations of Ice-Nucleating Particles in the Sea Surface Microlayer and Bulk Seawater in the Canadian Arctic during Summer. Atmos. Chem. Phys. 2019, 19 (11), 77757787. <https://doi.org/10.5194/acp-19-7775-2019>.*
- (3) Si et al. Ice-Nucleating Ability of Aerosol Particles and Possible Sources at Three Coastal Marine Sites. Atmos. Chem. Phys. 2018, 18 (21), 1566915685. <https://doi.org/10.5194/acp-18-15669-2018>.*

The criteria for the inclusion of literature data are that they are ship-based, atmospheric measurements with data at -15°C and that the samples have not been pretreated before measurement.

The sampling locations reported in Irish et al. (2019a) were added to Fig. 1. However, only two measurements at -15°C are above the detection limit, which is higher than in other data sets due to a smaller sample volume. Data from Irish et al. (2019b) is excluded because IN concentrations were measured from seawater samples. Only one ship-based measurement point at -15°C is reported in Si et al. (2018). The point in the Labrador Sea is now included. The legend of Fig. 1 and Tab. A1 have been updated accordingly.

There have been other ship-based IN measurements, including the very first, conducted by Cwilong (1948). They were not included because of the above criteria.

Technical corrections

P.3 L.27 Avoid beginning the sentence with a number if so, it should be hyphenated here

P.4 L.2 Same here avoid number at beginning of the sentence. Rearrange sentence

P.4 L.30 mid-September should be hyphenated

P- 8 Figure 3 Mention the zero line in the caption for easier reference to it in the text

Appendix C According to the text on P. 9 L14, the title of Appendix C should read ' $\dots \geq -20^{\circ}\text{C}$ '

P.15 L.10 correct the spelling of 'transit cruise'

Done.

References

- Cwilong, B.: Sublimation in the Atmosphere over the Oceans, *Nature*, 161, 62, 1948.
- Irish, V. E., Hanna, S. J., Willis, M. D., China, S., Thomas, J. L., Wentzell, J. J. B., Cirisan, A., Si, M., Leaitch, W. R., Murphy, J. G., Abbatt, J. P. D., Laskin, A., Girard, E., and Bertram, A. K.: Ice nucleating particles in the marine boundary layer in the Canadian Arctic during summer 2014, *Atmos. Chem. Phys.*, 19, 1027–1039, doi:10.5194/acp-19-1027-2019, <https://acp.copernicus.org/articles/19/1027/2019/>, 2019a.
- Irish, V. E., Hanna, S. J., Xi, Y., Boyer, M., Polishchuk, E., Ahmed, M., Chen, J., Abbatt, J. P. D., Gosselin, M., Chang, R., Miller, L. A., and Bertram, A. K.: Revisiting properties and concentrations of ice-nucleating particles in the sea surface microlayer and bulk seawater in the Canadian Arctic during summer, *Atmos. Chem. Phys.*, 19, 7775–7787, doi:10.5194/acp-19-7775-2019, <https://acp.copernicus.org/articles/19/7775/2019/>, 2019b.
- Si, M., Irish, V. E., Mason, R. H., Vergara-Temprado, J., Hanna, S. J., Ladino, L. A., Yakobi-Hancock, J. D., Schiller, C. L., Wentzell, J. J. B., Abbatt, J. P. D., Carslaw, K. S., Murray, B. J., and Bertram, A. K.: Ice-nucleating ability of aerosol particles and possible sources at three coastal marine sites, *Atmos. Chem. Phys.*, 18, 15 669 – 15 685, doi:10.5194/acp-18-15669-2018, <https://acp.copernicus.org/articles/18/15669/2018/>, 2018.