

Interactive comment on “Aircraft ice-nucleating particle and aerosol composition measurements in the Western North American Arctic” by Alberto Sanchez-Marroquin et al.

This manuscript presents aircraft measurements of immersion mode ice-nucleating particles (INPs) in the Western North American Arctic in March. The size-resolved chemical composition is used to identify the sources of INP. The conclusion is not new, but the aircraft measurements of INP in the Arctic are valuable. The following major comments must be satisfactorily addressed before consideration for publication.

General comments:

1. Better to give more detailed information about the flight track and sampling strategy. For example, Appendix A shows the sampling time varies from ~10 to 30 mins. During the sampling, does the flight sample cloud or not? The flight height varies from 100 to 700 m, how much percent of the time is within the boundary layer of each sample?
2. The March in the Arctic is very often influenced by Arctic haze (not only long-range transport of dust but also anthropogenic pollution or biomass burning). Do you see any indication of anthropogenic pollution? For example, sample C089_3 shows a high carbonaceous fraction, what is the source of carbonaceous? Why only reported the chemical composition of four samples?

Minor comments:

1. Lines 67-79: It is better to include the recently published paper from Creamean et al. (2022), which discussed the seasonal variation of INP in the central Arctic.
2. Line 98: Add “open leads” after snow. Open leads are most likely omnipresent in the central Arctic. And later when you discuss the aerosol sources in Lines 201 -209, the sea salt aerosols are also likely from open leads.
3. Line 137: Change “approach to (Vali, 2019)” to “approach to Vali, (2019)”.
4. Lines 190-192: Do the aircraft measurements also have cloud-related measurements, like liquid water content or cloud droplet number concentration?

5. Figure 4 and Table 1: I understand that Figure 4 left is the number size distribution. I assume Figure 4 right is the mass fraction of different components. My question is how to calculate the surface area of sea salt and dust in Table 1.
6. Line 365 Appendix B: Did you use the mean background value of all handling blank samples and subtract this value? The frozen fraction of handling blank samples shows a larger variation (Figure 2a). How to explain the larger range of backgrounds?
7. Figure B3: Please use the correct legends (solid or hollow) for each sample. For example, legend markers of C091_4 should be hollow.

References:

Creamean J M, Barry K, Hill T C J, et al. Annual cycle observations of aerosols capable of ice formation in central Arctic clouds[J]. Nature communications, 2022, 13(1): 1-12.