Review of “Microphysical and thermodynamic phase analyses of Arctic low-level clouds measured above the sea ice and the open ocean in spring and summer”, by Moser and coauthors, ACP-2023-44.

This is a very comprehensive article that compares the cloud microphysical properties in spring and summer seasons in low-level clouds over the Arctic ice and open water regions. The field programs sampled with the Polar 5 instrumented aircraft are AFLUX and MOSAiC-ACA. The properties of the clouds sampled during the two field programs differ because of the temperatures involves, the amount of sea ice sampled during each period, and the CCN/IN contents. Overarching reasons for conducting this analysis is to gain a better understanding of the arctic radiation budget-seasonally, and to provide data for use in the evaluation of climate model representations of the arctic radiation budget. Overall, this article provides useful information on the microphysical properties of arctic clouds. My comments appear below.

General Comments

Line 159. “filtering”. Change to “identification and removal of shattered particle artifacts”

191-192. The Brown and Francis (1995) m(D) relationship has been shown to underestimate ice water content. (https://doi.org/10.1175/2010JAS3507.1, 10.1175/JAMC-D-22-0057.1). Could you possibly use a second m(D) relationship as well that would be more accurate?

232: How is D_{eff} calculated? Does it include both liquid drops and ice particles?

In Figures 4 and 5, it might be good to put on the right side of each panel the approximate mean temperature with altitude.

Figure 4. I'd separate liquid and ice water contents.

Table 3. Separate ice and liquid water contents.

It might be helpful to modelers to have the PSD parameterized, as a gamma function. Also, show plots of the maximum measured particle diameter for each regime. Is the maximum diameter of the largest probe able to get the actual largest particles? Figure 7 with the PSD suggest that there are larger particles present but not measured.

246: is the air polluted or do you mean that there are fewer aerosols?

265: a stronger temperature inversion

Figure 6. This figure would be more interesting if you had two panels with separate panels for CDP and CIP+PIP data.

366. Right after Arctic. I strongly suggest having a figure with a schematic (pictorial) of the primary findings that would be simple to grasp.

Minor Points

Table 2 Year should be 2020, shouldn’t it.

231: "to" to "with"