First, we would like to thank the two anonymous Reviewers for having carefully read the manuscript and for providing their helpful and constructive reviews, which improved our manuscript. Point-by-point replies to the comments are here below.

For clarity and easy visualization, the Referee's comments are shown from here on in black.

> The authors' replies are in blue font with an increased indent below each of the referee's statements. The Line numbers (L.) in our responses refer to the unrevised manuscript.
>
> The relevant changes in the revised manuscript are below in green.

Authors' response to anonymous Referee #3 (https://doi.org/10.5194/acp-2022-98-RC1)

Overall Quality

This manuscript utilizes a merged-instrument approach to characterize precipitating ice particle habits at a remote site in inland Finlind. Primarily using 12-hourly soundings and the Multi-Angle Snowflake camera (MASC), the study determines via knowledge of ice particle history and growth regimes that approximately three-quarters of ice particles originate from cloud layers with top temperatures outside of the mixed-phase region (i.e., sub-liquid RH saturation [<99%]), suggesting that the majority of cloud layers are fully glaciated. Using an empirical formulation, they finally determine that the number of ice nucleating particles (INP) were likely sufficient to explain heterogenous ice production, suggesting an inactive ice multiplication mechanism (outside of possible collisions). Overall, the manuscript is of excellent quality in terms of science, documentation, figures, and structure. The authors clearly made a significant effort to explain their data processing in a concise manner. After addressing a few specific comments and technical corrections, I recommend this manuscript pursue publication in ACP.

> We thank the referee for reviewing our manuscript. We appreciate the positive feedback and helpful comments.

Specific Comments

Fig 6. & ~Line 183: I would point out to the reader that the color-scales on each panel are different.

> Thank you for commenting on this. We have added the following sentence in the caption of Fig. 6. We also added a sentence in captions of Fig. 4 and Fig. A6, which are figure that have had similar issues.
>
> The color scale ranges from zero to the total number of events for each group, so the color scale for each panel is different.

Line 159 & Fig. 3: What exactly is "visibility"? If it is similar to cloud base height, then these are an order of magnitude off. It would also be good to mention how cloud base height was detected within the instrumentation at the site. If it is a nm-wavelength active remote sensor,

then I would expect my interpretation of visibility to closely optically correspond with cloud base height.

> The cloud base height was measured by Vaisala CT25K ceilometer (Ceilometer CT25K User's Guide, Vaisala, available at: https://www.rish.kyoto-u.ac.jp/ear/ceilometer/ct25k.pdf, last access: 11 August 2022). The visibility was measured by Vaisala FD12P with an optical forward-scatter sensor that sees fog and precipitation particles (see https://www.livedata.se/images/Vaisala/Nederbord/FD12P.pdf, last access: 11 August 2022). The visibility measurement range is 10 to 50 000 m. This is basically documented in L. 116 with reference to the FMI web page (https://litdb.fmi.fi/luo0015_data.php, last access: 11 August 2022). We replaced the "visibility" with "horizontal visibility" throughout the manuscript. Consistently, we adapted the sentence in L. 159.
>
> During snowfall, the horizontal visibility was on average 2020 m, the average base height (or vertical visibility) of the lowest cloud was 213 m, […].

Fig 3: I'm confused about the sea level pressure measurements. If the station is only 179 m ASL, these values are way too low.

> Thank you very much for this valuable comment. It brought to our attention that we have made a mistake in calculating the ground-based meteorological parameters for the 15 minutes intervals. We have corrected this and updated the Fig. 3. Amongst other variables, the sea level air pressure values are higher than before and now make sense. In addition, the related values mentioned in the text (L. 154 – 160, L. 192 – 194) and Fig. A6 were corrected.

Fig 2 & Line 134: Why 15 minutes prior to sounding release? Wouldn't 15 minutes aftertward be more representative of the cloud that is producing the precipitation?

> Since radiosondes were launched from the same ground station at which we observed falling snow crystals, it was only at ground level and at the moment of launch that both kinds of observations coincided in space and in time. Crystals formed at any point in the profile while it was sounded, have reached ground level downwind the station and at a later point in time. By relating the humidity profile to crystals observed 15 minutes prior to launch we assumed that the profile is, when sounded, still representative of what it was up to 15 minutes earlier upwind the station. If we would have related the sounded humidity profile to crystals observed during the 15 minutes following sounding, we would have had to assume the sounding to be representative of the moisture profile still upwind the station, from where crystals would arrive in the following 15 minutes. Neither assumption is secure, but the first seemed to us more reliable than the second. Anyway, the sky was fully cloud covered (8 octas; see L. 162) during snow events and the choice of assumption probably makes no big difference.

Line 213: Nice conclusion!

Thank you.

Technical Corrections

Line 61: “automatically” should be “automatic”

Done.

Line 63: “summery” should be “summer”

Done.

Fig A1: “lowlight” should be “highlight”

We changed the wording into “The grey areas mark…”.

Line 81: suggest using “length” instead of “height”

Done.

Line 94: Should “An ice particle classified” be “An ice is particle classified”?

We changed this sentence as it was a little confusing.

Unrimed ice particles correspond to riming degrees of 0 and 1, and rimed particles to riming degrees of 2 to 5 according to Mosimann et al. (1994).

Line 153: Should “weighed” be “weighted”?

Yes, thank you. Done.

References

Mosimann, L., Weingartner, E., and Waldvogel, A.: An Analysis of Accreted Drop Sizes and Mass on Rimed Snow Crystals, J. Atmos. Sci., 51, 1548 – 1558, https://doi.org/10.1175/1520-0469(1994)051<1548:AAOADS>2.0.CO;2, 1994.