On behalf of the co-authors, I would like to thank for all the comments and list of corrections that helped to improve the quality of our paper. The detailed responses to the raised issues are provided in the attached file. All the answers are written in red font to make them easier to find.

This manuscript describes microphysical retrievals using multi-frequency radar. Retrievals of ice water content, mean mass diameter, and degree of riming are demonstrated. The manuscript shows the difficulty in retrieving the degree of riming, particularly from a single-wavelength. The authors conclude by demonstrating the retrievals from single, multi-frequency and multi-frequency with Doppler velocity in a research flight. The single frequency has little information content in the degree of riming or in volumes with large drops. The multi-frequency retrievals improve upon the single frequency, but still struggle with degree of riming. By adding a Doppler velocity to multi-frequency, the retrievals are in better agreement with the measured quantities.

Overall this manuscript is straightforward and shows interesting results for a difficult problem. I have a few main comments as well as some smaller things I noticed.

- It seems one of the main take-aways the authors would like the reader to have is the improvement to the microphysical retrievals, particularly the degree of riming, when a Doppler velocity is included. However, it was unclear to me how this is used in the retrieval and seems to come out of nowhere when Fig. 4 is introduced. Is it from nadir or zenith (or some interpolated mean like reflectivity)? Does the Doppler velocity include air motions? How is it included in the actual retrieval?

To address this issue, we've slightly modified the first paragraph of Sect. 3.3. Now it clearly states what has been used as the radar measurements at the flight level: "The optimally estimated radar measurements and the microphysical data described in the previous subsection are used for the validation of the microphysical retrieval. First, the triple frequency radar reflectivity at the in-situ flight level is used to form the measurement vector (see eq. 7). Then, the expected value of the state vector is estimated using the methodology presented in Sect. 2.3. Finally, the retrieval results are evaluated against the microphysical properties of snow determined using the optimal estimation framework (see Sect. 3.2). These validation data serve as an in-situ "truth". An analogous analysis is repeated for two other retrievals: one that is based on single frequency X-band radar reflectivity only and another one based on triple frequency reflectivity data with the addition of the mean Doppler velocity at the X-band. Note that, the Doppler velocities as well as the radar reflectivity values at the flight level are not directly measured. They are estimated from the radar measurements below and above the airplane and in-situ probe data using the data assimilation technique that exploits the radar simulator described in Sect. 2.2. Their uncertainties are estimated by propagating the errors on the state vector, x (eq. 6)."

- Figure 2 is important but I had a hard time interpreting it. What is the difference between the top row and the bottom row? Please clarify.

The caption of Figure 2 was modified to make it clear. Now it says:
" Panels a, b, c: expected values of $\log_{10}D_m$, $\log_{10}$IWC, $\log_{10}\alpha$ in the DWR_{X-Ka}–DWR_{Ka-W} space for Z_X= 20 dBZ. Panels d, e, f: uncertainties of the quantities presented in the top row (see the color bar captions). The inverse model is derived from the in-situ airborne PSD measurements during MC3E, IPXEx, OLYMPEX and HAIC/HIWC campaigns."

- Figure 3: I'm confused about how the uncertainties are presented in this figure. If I am interpreting this correctly the retrieval of degree of riming has very little uncertainty middle of the flight leg (~1950 – 2110 UTC) (i.e. no black bars), and similarly the measured IWC in panel b (very small green bars)?

The panels that show the reflectivity measurements have been modified to make them more consistent with the other measurements. Now all the panels show the state vector prior the optimal estimation retrieval in green and the posterior value in black. The shading represents the uncertainty, again green and black colors correspond to the prior and posterior errors, respectively.

Minor comments:

Ln 98: Remove or expand '(REF)'.

'(REF)' was removed

Ln 145: Which WC is this – IWC or LWC?

WC was changed to IWC.

Section 3: It is odd to have "3.0.1" etc. for the sections—remove the .0. and make 3.1, etc.

It was corrected. Thank you for pointing it out.

Figure 3: I'm curious why the IWC are presented in kg/m3? In the text this is stated in g/m3 (such as the uncertainty in ln 210). Similar comment for all plots of IWC.

The units of the IWC in the figures will be consistent with the units in the text.

Figure 4: panel b is misaligned compared to the other 2 panels.

The panel b will be aligned with the rest in the final version of the manuscript.

Ln 241: Please check the sentence beginning "For negligible DWRs, multi-frequency information is reduced so the difference between the algorithms." This is not a complete sentence.

It was modified as:

“For negligible DWRs, the multi-frequency information is reduced to one frequency and the difference between the algorithms disappears.”

Ln 255: “estimates is available” should be “estimates are available”.

It was corrected.