

The revised manuscript presents an iterative-based approach to retrieving DSD, reducing a number of conditions, from a unique setup that includes dual frequency dual-pol ground-based radar. In general, the manuscript is well-written and shows a good structure. However, the evaluation section needs to be clearer, some concluding sentences read too strong, and quantitative numbers are lacking.

I would suggest a round of major revisions:

Section 2.2

Radar calibration: Add one or two sentences related to the calibration status of the radars (reflectivity) as Z is an input to the PSO algorithm.

Lines 160-165: Are these conditions in range and Z values part of the methodology or is it meant only for validation purposes? Please clarify this in the manuscript and re-arrange accordingly. If these values are part of the methodology (in an operational context), then how should we proceed to have a complete “map” of retrieve DSD? Perhaps this needs to be discussed in the conclusions.

Lines 168-172: Remove it because all these were mentioned before in section 2.2.1

Lines 174-175: Clarify that Z is not yet corrected from attenuation.

Figure 4: Add the raw phidp to compare with the processed phip (FIR filtering). For easy comparison, the initial phase offset can be subtracted.

Lines 181-183: Clarify that Z (S-band) also suffers from attenuation. The way it read now, tell the reader that Z (C-band) is the only one sensitive to attenuation.

Line 230, Eq(7): Clarify if the Cost is estimated gate by gate or per radial, i.e., are the variables Z and phidp single values or vectors?

Eq(9): “four hundred iterations for each retrieval” . This may lead to a large computational time as this retrieval is gate by gate. However, I have not read anything related to this. If this is a burden, then please add a comment about it.

Line 243: “starting from the one nearest to the radar”. Is that the case? Because I thought the minimum range is set to 25 km.

Line 245: “once a representative DSD” Is this the same as the best DSD or still under the optimization search. Please clarify it in the text.

On the same line: “the attenuation is calculated”. Please add something like .. is calculated based on Equation (5). So far Equation (5) was not indicated yet.

Line 254-255: Replace “This process continues” by “This gate by gate process continues” or similar. Replace “at which point the final retrieval is performed” by “because the range criterion < 70 km” or something similar.

A related question: why the algorithm stops at the location of the disdrometer that is located 70 km from the radar site? One would like to continue till the end of the radial. Please clarify somewhere in the text.

A second related question: What happens to the algorithm when rain starts around 25 km, i.e., when the difference between $\text{phidp}(\text{C-band})$ and $\text{phidp}(\text{S-band})$ is not sufficient (see line 155). Then DSDs are not retrieved? Clarify this somewhere in the text.

Lines 267-269: Please clarify what is the relation between 10 days and 167 cases, how a case is defined?

Section 3.1

Line 278: “The majority of the cases” ... write how many, 5 out of 8?

Line 281: “Deviations can be found...” That is obvious. What reasons would the authors suggest for such deviations?

Figure 8: Add the resulting rainfall rate values from disdrometers (blue line) to each subplot so that we can associate them with a rain intensities.

Lines 290-294 Rewrite to something like this: This simulation involves calculating KDP using equation(4) for varying drop size distributions using a gamma-modeled DSD ...

Line 300: Replace “C-band reflectivity excluded” by C-band differential phase excluded.

To strengthen the qualitative assessment. I suggest the following points:

- As the estimation of accurate phidp from raw phidp is not straightforward, especially at C-band, show some radials of processed phidp (C and S-band) and compare them with optimal DSD-based phidp .
- Attenuation correction, Figure 11: Only showing one single radial is not convincing and difficult to suggest conclusions. Similar to my previous point, show some more radials with diverse Z radial profiles (or a PPI).

- Lines 305-310: It is not consistent with Line 290 (“key question”). I suggest you either i) make a strong analysis to address this question or ii) Rewrite Line 290 and move Equation (9) and Figures 9 and 10 to Appendix.

Section 3.2

This sections lack of statistical results. Showing a time series plot is not so relevant in this study. I would suggest using scatterplots and show metrics such as RMSE, Bias, correlation, etc. For instance, a scattering plot related to the attenuation correction: Z(retrieved DSD) vs Z(disdrometer). And two more related to KDP and Rainfall rate.

Lines 345-347: “Deviations from this correlation can mislead the algorithm” These lines are somehow “in the air”. I suggest the authors to add some related references for the estimation of KDP that use self-consistency. For example:

- Park, S., V. N. Bringi, V. Chandrasekar, M. Maki, and K. Iwanami, 2005: Correction of Radar Reflectivity and Differential Reflectivity for Rain Attenuation at X Band. Part I: Theoretical and Empirical Basis. *J. Atmos. Oceanic Technol.*, **22**, 1621–1632, <https://doi.org/10.1175/JTECH1803.1>.
- Giangrande, S. E., McGraw, R., and Lei, L.: An application of linear programming to polarimetric radar differential phase processing, *J. Atmos. Ocean. Tech.*, **30**, 1716–1729, 2013.
- Gorgucci, E., Scarchilli, G., and Chandrasekar, V.: Specific Differential Phase Estimation in the Presence of Nonuniform Rainfall Medium along the Path, *J. Atmos. Ocean. Tech.*, **16**, 1690–1697, 1999.
- Reinoso-Rondinel, R., Unal, C., and Russchenberg, H.: Adaptive and high-resolution estimation of specific differential phase for polarimetric X-band weather radars, *J. Atmos. Ocean. Tech.*, **35**, 555–573, 2018.

Section 4:

Discuss more the generalization of the proposed algorithm to retrieve DSD in terms of dual frequency systems and the range constraint (> 25 , < 75 km).

Clarify if this algorithm can be applied in real-time operations. If not, then what aspects would need further work?