

The authors thank the reviewer for carefully reading the manuscript and providing numerous suggestions on how to improve the paper. Each comment will be addressed in the following.

Comment:

Line 79: Rephrase "QVP-radars" to perhaps "radar-centric QVPs" or "radars providing QVPs".

Answer:

Thank you for this suggestion. We have replaced "QVP-radars" with "**radars providing QVPs**".

Comment:

Figure 3: Add the mutual distances between the MIRA and the other radars to the figure for easier visualization (the information is already in the text; e.g., the distance from MIRA to MHP is 57 km).

Answer:

Thank you for this suggestion. We have added the distances between MIRA-35 and all relevant radars to Figure 3.

Comment:

Figure 4: According to the figure, the POLDIRAD RHI data are not directly over the MIRA-35. What is the offset? The authors should add this fact to the text where appropriate.

Answer:

Thank you for this observation. While the pointing accuracy of POLDIRAD is monitored, a perfect orientation towards MIRA-35 cannot be guaranteed and comes with a certain pointing error. Considering the distance of 23 km, a pointing error of just 0.25° would lead to roughly 100 m distance between measurement and location of MIRA-35 which is close to the offset visible in this case. We have added the following sentence to the description of the figure to point this out:

The data of POLDIRAD is not directly above MIRA-35 with a very minor offset which is the result of the pointing error associated with the pointing accuracy of POLDIRAD.

Comment:

Lines 235-310: Is reflectivity averaging performed on the linear or dB scale? Z and ZDR averaging should be on the linear scale.

Answer:

All averaging steps are indeed performed in the linear space. We have added the following sentence to make this clear:

This and all following averaging steps are done in linear space for each variable.

Comment:

Line 345: The radar measurements at higher frequencies are affected below the melting layer and in the melting layer, where the melting begins.

Answer:

Thank you for this clarification. We have changed the sentence as follows:

[...] where the beam remains in or below the melting layer (e.g. at low elevation angles) and therefore encounters mostly liquid hydrometeors [...]

Comment:

Lines 373-374: Rephrase "Germany was located at the front side" to perhaps "Germany was affected by the front side".

Answer:

Thank you for this suggestion. We have changed the sentence accordingly.

Comment:

Line 400: The authors should add the term "mostly" to "offers gapless" to address the features in Figure 8 more appropriately.

Answer:

The word "mostly" indeed helps to capture the features of Figure 8 more appropriately. We have changed the sentence accordingly.

Comment:

Line 408: The part of the sentence "slightly bright band..." is confusing. Clarify.

Answer:

We understand that the word "slightly" is misleading. The bright band in Figure 9 (b) is clearly distinguishable. We have therefore removed the word "slightly" from the sentence.

Comment:

Line 415: The authors should use "fewer" instead of "much less" as it fits the context better.

Answer:

Thank you for this correction. We have replaced the phrase accordingly.

Comment:

Lines 418-419: Add commas to the sentence - it is harder to read without them: "Alone from the data of the radar MEM, the ML height can, therefore, only be estimated to lie between 1.2 km and 3 km within the lowest measured radar beam."

Answer:

Thank you for this suggestion. We have implemented the commas accordingly.

Comment:

Lines 484-485: Rephrase the sentence, it is hard to follow. Perhaps "On this date, more high-ranging clouds upwards of 7 km were present, marking the region where the closer radar ISN has less coverage due to the limited number of measured elevation angles." fits the context better.

Answer:

Thank you for this suggestion. We have modified the sentence accordingly.

Comment:

Line 495: "DB" should be "dB".

Answer:

Thank you for this correction!

Comment:

Line 498: There is a subtle increase in Z_e (Figure 11 (b), MHP) before 17:00, between 17:38 and 17:45 and at 17:54 UTC with respect to 3 km height, indicating ML. However, the ML signal is very difficult to interpret without other measurements.

Answer:

Thank for this very detailed observation. We have modified the sentence accordingly:

Very subtle increases in Z_e shortly before 17:00 UTC, between 17:38 UTC and 17:45 UTC as well as at around 17:54 UTC in roughly 3 km height hint to the position of the ML; they are however, difficult to interpret without the measurements of MIRA-35.

Comment:

Line 504: Add "to" between "due the...".

Answer:

Thank you for this correction. We have implemented it accordingly.

Comment:

Line 508: Remove one "method" from "profile method method by...".

Answer:

Thank you for this correction. We have implemented it accordingly.

Comment:

Lines 553-555: The statement about ice hydrometeor attenuation is questionable. Liquid hydrometeors experience much higher attenuation than ice particles at the C band. Authors may want to investigate the causes of such behavior further. Could the different microphysics along the path explain and account for the difference? Another convective cell along the route, closer to the MEM?

Answer:

We agree that ice hydrometer attenuation might not be the reason for the observable differences in the BA-CVPs of Φ_{dp} and the retrieved liquid hydrometeor attenuation using the gate-by-gate approach of [Jacobi and Heistermann \(2016\)](#). Following the suggestion of the reviewer, we examined the beam path more closely for the duration between 08:30 UTC and 10:00 UTC where the BA-CVPs of Φ_{dp} and the retrieved liquid hydrometeor attenuation differ the most. Several cells with high reflectivity traveling through the beam path are observable which might be able to explain the observed differences. Specifically the influence of the melting layer in convective cells on the radar beams traveling at an angle through the melting layer for a prolonged period might lead to effects that are captured by Φ_{dp} but not the reflectivity-based approach of [Jacobi and Heistermann \(2016\)](#) valid only for liquid hydrometeor attenuation.

To include these considerations, we have changed the respective text passage to:

[...] While examining the beam path for MEM during time periods where the extracted Φ_{dp} BA-CVPs and the calculated liquid hydrometeor attenuation differ significantly (e.g. 08:30 UTC to 10:00 UTC), several cells with strong reflectivity signal traveling through the beam of MEM were observable. The influence of the melting layer of convective cells on the radar beams traveling within the melting layer at an oblique angle over a long distance might lead to effects that are captured by Φ_{dp} but not the reflectivity-based liquid hydrometer attenuation by [Jacobi and Heistermann \(2016\)](#).

Comment:

Lines 570-571: Permute the word order in "the with range decreasing sensitivity", it is hard to follow ("the decreasing sensitivity with range" should fit much better).

Answer:

Thank you for this suggestion. We have modified the sentence accordingly.

Comment:

Line 639: Use "beam-broadening" instead of "-broadening".

Answer:

Thank you for this suggestion. We added the word "beam" before "-broadening".

Comment:

Line 641: Use "fewer" instead of "less".

Answer:

Thank you for this suggestion. We have replaced "less" with "fewer".

References

Jacobi, S. and Heistermann, M.: Benchmarking attenuation correction procedures for six years of single-polarized C-band weather radar observations in South-West Germany, *Geomatics, Natural Hazards and Risk*, 7, 1785–1799, <https://doi.org/10.1080/19475705.2016.1155080>, 2016.