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. Please note that the order of the comments has changed slightly as one of the comments has been moved to the end. This was done to allow the image in the respective comment to be displayed at the correct position within the comment it relates to without disturbing the text flow of other comments.

Comment:
Line 215-217: I am a bit confused here as the C-band radar resolution is 50 m and the moving average windows size is also 50 m?
Answer:
Thank you for this observation. The 50 m are indeed only half of the bin height. The chosen bin height value is 100 m. We have corrected the value given in the manuscript accordingly.

Comment:
Line 221: Please elaborate the reasoning as to why all dual-pol variables require Z based weighting? And how is done?
Answer:
We understand that using the expression "all" is misleading in this case. The weighting is applied for Z_{dr} and Φ_{dp} only which we now also point out in the manuscript. It is well known (e.g. Ryzhkov et al. (2016); Ryzhkov and Zrnic (2019)) that noise impacts Z_{dr} or Φ_{dp} more significantly and is noticeable for even moderate signal-to-noise-ratios. Especially when only a small reflectivity signal is detected, Z_{dr} and Φ_{dp} can have substantial bias. Since all averaging for the BA-CVP method is done in linear space, the impact of such noise-related biases can be significant. By weighting Z_{dr} and Φ_{dp} with their reflectivity values during averaging, we ensure that values with high reflectivity and less bias have more weight in the average than values with low reflectivity that might be influenced by noise and therefore carry a bias. Through this averaging procedure, we also try to mimic the behavior of a real radar measuring a volume where the polarimetric return in Z_{dr} and Φ_{dp} is produced mainly by the hydrometeors with strong reflectivity.

The reflectivity-weighting procedure for the dedicated radars is very similar to the second (beam-aware) averaging step in the BA-CVP method without the weighting factors for area of intersection $w_{\mathrm{b,i}}$ and azimuthal averaging $w_{\mathrm{a,i}}$. We introduce a normalized weighting factor $w_{\mathrm{z,i}}$ for each data point x_{i} within the current height bin. The weighting factor for each x_{i} is defined as the reflectivity value of x_{i} divided by the sum of all reflectivity values contributing within the current height bin.
To make this procedure more transparent, we have added two equations and a short paragraph for explanation in the corresponding section. We have also added a short note in section 3.1.2. where we explain the BA-CVP method referencing this explanation, since the BA-CVP method also utilizes reflectivity weighting as stated previously.

Comment:
Line 300: For this paragraph, I am not sure if I understand the BV-CVP extraction for PPI data. The traditional QVP/CVP method consider distance compared with center point of selection. Can you please demonstrate how the new BV-CVP differs from traditional CVP in this point? Most importantly, at higher elevations, the available scans are sparse, do you mean the BV-CVP can fill the gaps? Bus this can only be true in this study's set up when you have more than one radar doing PPI scans nearby right?
Answer:
The reviewer correctly points out that the original CVP method considers the contributions of data points within a height bin based on their vertical distance to the center point of the respective height bin. This procedure leads to artificial gaps in the extracted profiles in areas with low data point density even if the original measurement volumes had no gaps in between them (Murphy et al., 2020).
The BA-CVP method counteracts this by weighting each data point by the area of intersection between the beam-broadened range gate and individual height bin instead of just the vertical distance to the height bin center. Data points therefore do not have to physically be within the height bin. It is enough for the measurement volume to intersect the height bin. The data point is then factored into the average according to the size of the intersection reducing the occurrence of artificial gaps.

This beam-aware treatment of each data point furthermore allows contributions of multiple radars in range of the point of interest which as correctly mentioned by the reviewer closes gaps based on measurement strategy. The combination of multiple radars might also be possible within the original CVP method, however, due to the vertical distance weighting, data points with considerable measurement volume mismatch might be weighted equally reducing the achievable resolution.
In order to better demonstrate the main benefits of the BA-CVP method over the original CVP method by Murphy et al. (2020) we have added the following bullet points to the manuscript at the end of section 3.1.2:

- *BA-CVP method considers beam broadening and weighs data points by area of intersection between height bin and radar beam instead of vertical distance to height bin used in the original CVP method*
- *Data points not within a height bin still contribute to the height bin average if measurement volume intersects the height bin, reducing gaps in areas with low data point density*
- *Possibility to combine the data of multiple radars at different distances to the point of interest due to beam-aware treatment of data points, increasing statistical significance and reducing gaps*
- *Gaps in extracted BA-CVPs are real, unmeasured gaps that were not part of any radar measurement volume*

Comment:
Line 355-370: More clarification is needed here, how is hydrometeor induced attenuation done? By only Z? Please elaborate on this.
Answer:
In this paper we do not correct for any hydrometeor attenuation as the main intention of the paper is to describe the BA-CVP method and show its application in two different case studies. We merely calculate the liquid hydrometeor attenuation using the gate-by-gate approach based on reflectivity by Jacobi and Heistermann (2016) and then compare the calculated liquid hydrometeor attenuation to BA-CVPs of Φ_{dp} to discuss the usage of the BA-CVPs of Φ_{dp} as a marker for strong path attenuation. This is done to investigate the possibility to filter out measurement pixels with strong path attenuation that might influence the statistics of the extracted profiles. For more details on the gate-by-gate approach based on reflectivity please refer to Jacobi and Heistermann (2016).
To make this more clear, we have rewritten the corresponding passage in the corresponding section as follows:
In this paper no hydrometeor attenuation is applied to the measurements. Instead, the calculated liquid hydrometeor attenuation based on the gate-by-gate approach of Jacobi and Heistermann (2016) is compared to the extracted BA-CVPs of Φ_{dp} and the usage of the Φ_{dp} BA-CVPs as a qualitative marker to filter out measurement pixels with high attenuation is discussed.

Comment:
Figure 11: For the 2nd case, it seems the higher resolution MHP are overly smoothed to lower resolution as in ISN and MEM, please justify the resolution degradation here.
Answer:
As correctly stated by the reviewer, for the second case, the data of the radar MHP was used. MHP and MIRA-35 are 57 km apart. The beams of MHP at the location of MIRA-35 are therefore already broadened to roughly 1 km which leads to natural smoothing of the measurements when compared to the first case where data of POLDIRAD with a distance of only 23 km was used. The processing and moving average performed on the raw RHI data have minimal impact as the bin height is only 100 m. We have added the following sentence to point this out more clearly:
As MHP is about 2.5 times further away than POLDIRAD, the results of the dedicated measurements are expected to be affected by beam-broadening and therefore appear a bit smoother compared to the first case study.

Comment:

Figure 8: Can you please add the difference between BV-CVP vs. MIRA? Also, please extend this to ZDR, KDP and CC as well. In particular, a vertical profile of mean difference and their standard deviation are needed to quantify the difference.

Answer:

Thank your very much for this comment. The idea of adding mean profiles with their standard deviation greatly helps the reader to understand the capabilities of the BA-CVP method in more detail and confirms previous findings.

Since the first case study consists of precipitation in varying intensity with several convective cells traveling over the region of interest, we have added mean profiles of Z_{e}, Z_{dr} and the dual-wavelength ratio ($\mathrm{DWR}_{\mathrm{C,\,Ka}}$) for a more stratiform time period between 08:50 UTC and 09:50 UTC where the Φ_{dp} of POLDIRAD and the extracted Φ_{dp} BA-CVPs of the operational radars indicated low path attenuation for best comparability:

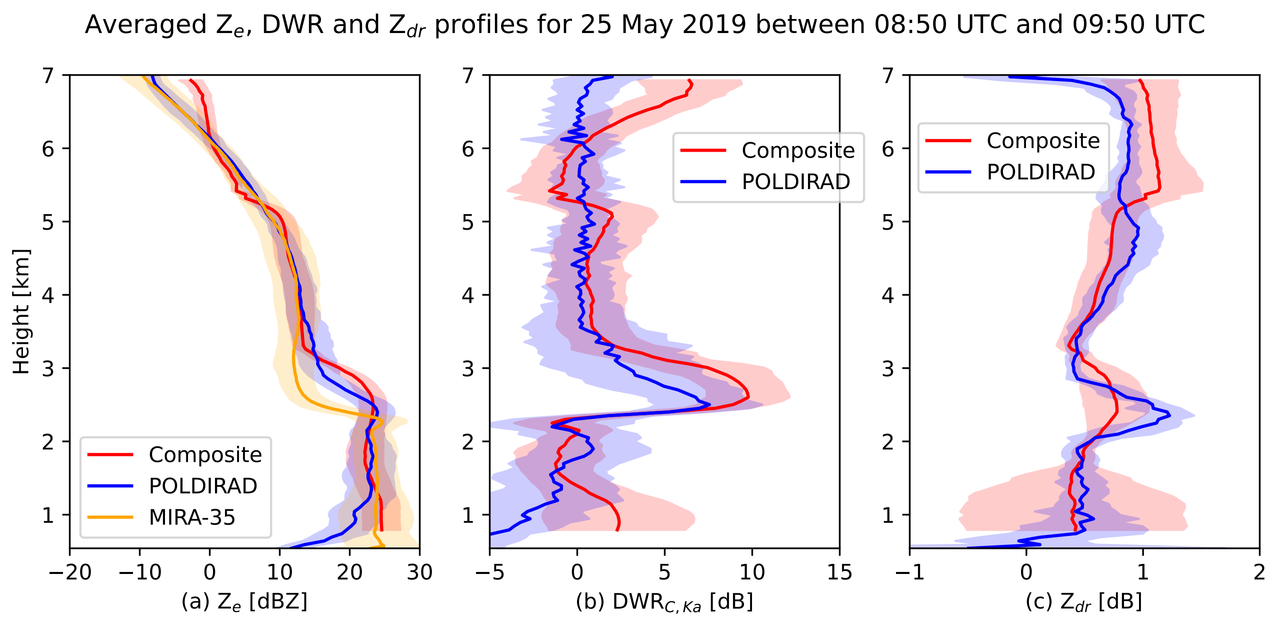

Figure 1: Averaged profiles of Z_{e} in (a), $\mathrm{DWR}_{\mathrm{C,\,Ka}}$ in(b) and Z_{dr} in (c) for a more stratiform time period on 25 May 2019 between 08:50 UTC and 09:50 UTC. The colored area is the standard deviation.

We have also added a paragraph to introduce and discuss the graphic in section 4.1.

Although we agree that plots of K_{dp} and the cross correlation would indeed be interesting from a microphysical perspective, processing and further analysis of these additional radar variables would lie outside of the scope of the paper.

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.

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