

Response to review comments-1

There are still a few minor issues that the authors should address in the final revision.

1. The full name of PMR should be given at its first occurrence in line 71 of the manuscript.

Reply: It has been added at line 72 in the revised manuscript.

2. In line 86 of the manuscript, please check whether a hyphen should be used between "phase" and "array", and ensure consistency with the rest of the manuscript.

Reply: It has been added at line 86 in the revised manuscript.

3. In the legend of Figure 2, using "band" would be more appropriate than "type".

Reply: It has been re-plotted and replaced in the revised manuscript.

4. In line 145, the manuscript mentions using data with elevation angles less than 4.5 degrees. What is the reason for this choice? Is it for computational efficiency, or are there other considerations?

Reply: In AWRCM, we only used data from the lowest five layers, mainly for computational efficiency. This is especially relevant during widespread stratiform precipitation events, where there are many overlapping points between adjacent radars, which would significantly reduce subsequent computational efficiency.

We have added a explanation of this point at line 94 in the revised manuscript.

5. The reference currently in line 254 should be moved to line 151, as this is the first time the threshold parameter is mentioned after its description has been added.

Reply: It has been adjusted in the revised manuscript.

Response to review comments-2

Thanks for the revision and answers to comments. They are appreciated.

The paper has improved, but you still miss to discuss obvious features in some of the plots, as detailed below. There are also some minor things I have noted:

Reply: Thank you for your further comments on the manuscript. We have carefully reviewed them and made the corresponding revisions. Our detailed responses are as follows.

1.I 267 please name the SNR thresholds

Reply: We have added the clarification at line 303 in the revised manuscript.

2.caption fig 10: please indicate what kind of correction has been applied.

Reply: We have added this clarification to the caption of Figure 10 in the revised manuscript.

3.I 314: briefly explain how the fuzzy logic classifier to identify interferences, since the reference is in Chinese and thus not accessible to at least some of the readers.

Reply: We extract four physical parameters that characterize radial interference echoes: DB, representing the consistency of echo power between adjacent range gates along the radial; RREF, representing the spatial extent of the reflectivity factor along the radial; TDBZ (units: dB^2), representing the texture consistency of the local reflectivity factor along the radial; and SPIN, representing the sign change of adjacent reflectivity factors within a local region. Based on the probability distributions of these parameters, we construct corresponding membership functions and a binary (0–1) decision criterion for radial interference echoes. The criterion values are then combined via a weighted summation, and any point whose aggregated value exceeds a threshold is identified as a radial interference echo and removed.

We have added the clarification between I 315–322 in the revised manuscript.

4.caption fig 15: please explain the legends in the plots (eg. GB). Plots should be understood without going to the text to check for abbreviations.. Make sure you do this for every figure in this paper.

Reply: We revised the legends of Figures 15, 16, 19, and 20 to use the names of the two methods for definition. In addition, we replaced the descriptions of the two analysis methods in Section 3.2 with their abbreviations. This makes the sources of the results more explicit and helps readers better understand the analysis.

5.I 353: how do you define an observation time? do you require a certain sample size? They are all characterized by the same meteorological conditions. If you have defined it somewhere, please repeat it here so that the reader can more easily follow your discussion.

Reply: “observation times” refers to a single complete volume scan, which typically takes about 5–6 minutes. The analysis period shown in Fig. 17 spans January to October 2024. After applying the screening criteria described earlier, the analysis primarily focuses on stable precipitation targets; however, different stations experienced different weather processes. In addition, when generating the bar charts for the above statistics, we only selected results where the sample size in the overlapping areas of neighboring radars exceeded 200 to ensure

the stability of the results. In the subsequent analysis of single-station, single-time cases, we did not impose this constraint in order to preserve as much detail as possible in the results. We have add these clarifications in line 353-362 in the revised version to help readers better understand the context.

6.Fig 18: how do you explain the 2 modes you can generally see in the plots? I haven't seen a discussion in the text, or did I missed that?

First mode seem to suggest that the bias of the radar increases with reflectivity. Does it suggest, that there is a problem with the attenuation correction? Such a discussion of an obvious feature should be included.

Reply: Figure 18 shows the satellite–ground analysis results for four S-band weather radar stations, where attenuation correction is not an issue. You may be referring to Figure 22. As you noted, the attenuation correction for the X-band phased-array radars is not very satisfactory; even after correction, the reflectivity remains biased low, and the bias increases with increasing reflectivity factor. We will add these points between l406-409 in the revised manuscript.

7.l 368 reference to fig 19: system 12 and 13 seem quite good in term of the bias for both methods. System 5 has a large bias. Especially for latter large bias you don't give an explanation. Is there a hardware problem, assuming the systems are identical (are they?)

Reply: The bias observed for System 5 is indeed pronounced. Our preliminary assessment points to a potential radar hardware issue. As this station is not part of the national operational assessment network, we are unable to implement centralized calibration and quality control procedures. Nevertheless, we have notified the provincial meteorological bureau to initiate a thorough investigation.

8.l 385 in reference to figure 21: you show individual observation time. Please give the definition of an observation time in the caption. Is it day of observation meeting certain conditions.

Reply: Individual observation time also refers to a single complete volume scan, typically lasting about 5–6 minutes. In our analysis, we did not specifically select observation days under particular conditions because both methods are engineered to run automatically. Each volume scan is processed, and target classification and filtering are implemented within the algorithms.

We have addressed this at line 391 in the revised manuscript.

9.Figure 22: radar in the right-hand figure behaves much different than the radar in the left-hand figure (which looks quite reasonable). A discussion is missing

Reply: Our analysis indicates that the satellite–ground comparison results for the radar on the left side of Fig. 22 are mainly concentrated in August 2024, whereas those for the radar on the right span June–September. The longer time window entails greater diversity in precipitation types, which may lead to differences in the satellite–ground scatter distributions. That said, this conclusion requires further verification with more observational data. We have

added a preliminary discussion in line 401-405 in the revised manuscript.

10. Figure 24: the figure after calibration: seems like the sample size and especially cases with reflectivities larger than 30 dB are missing; so I would say the suggested decrease in bias after calibration cannot be made unless you have comparable sample size and spread in meteorological situations.

Reply: Indeed, as you pointed out, the previous satellite–ground comparison after radar calibration was based on a relatively small sample size and lacked data above 30 dBZ. In the revised manuscript, we have extended the analysis period to July 2025, which increases the sample size compared with the original submission. We agree with your assessment: since this is a case-based analysis, it is still premature to conclude that “the bias decreases after calibration.” We will revise the corresponding statement accordingly in lines 424–431 of the revised version.