The manuscript describes a set of processing techniques applicable to spectral observations from cloud radars. The techniques include clutter filtering, mitigation of artefacts resulting from pulse compression, and merging of observations taken with different pulse modes.

We sincerely appreciate the reviewer for pointing out the aspects which were not well addressed in the original submission. We have made major revision to the manuscript based on your comments. Please see below our response to your comments.

The manuscript has many flaws, to name few:
1. The authors claim "…the results show good performance of clutter/sidelobe suppression and spectral merging", but the manuscript completely lacks any quantitative evaluation of the proposed methods.

We agree with the reviewer that a quantitative evaluation would definitely strengthen our conclusions. In the revised manuscript, we have added a section "5.3 Quantitative evaluation" which presents quantitative comparison of spectral moments before and after the spectral processing. The evaluation of clutter removal and sidelobe mitigation are given in sections "5.3.1" and "5.3.2", respectively. Please see the revision for details.

2. The described methods contain a number of decision rules (e.g. Figs. 2 and 6). Intuitively, these rules may sound to be reasonable. I, however, would certainly expect a statistical justification of the used rules. For instance, the authors write "The selection of deltaS=3dB is a compromise between the radars' observation uncertainty and the spectral ratio between different observing modes." I do not think this is enough. First, observational uncertainties depend on the operational settings. What if I use different settings on my radar, shall I change the settings to the ones used for the manuscript in order to apply the method? Or how shall I adapt the method to use it with different settings? Second, which rule was used to get the compromise? What I, as a radar operator, would like to see is, for a given pulse modes, what is the probability not to filter clutter? What is the probability to erroneously filter out a spectral line with meteorological signal only? How these probabilities depend on the pulse modes? How would these probabilities change if different thresholds are used? There are no answers in the manuscript.

We feel sorry that the process of threshold selection was missed in the original manuscript. In the revised manuscript, the details are given below,

1. The selection of $|\Delta S| = 3$ dB in Fig. 3 (revised manuscript).

   In the revised manuscript, we have clarified this point in Section 3.1:

   "The selection of the threshold is a comprise between false-alarm and miss hit. We want to preserve the meteorological signals at our best, therefore we checked the magnitudes of $|\Delta S|$ for meteorological signals. Figure A1 (Appendix) presents the statistical plot of $|\Delta S|$ for meteorological signals (height of 2 ~ 3 km and Doppler velocity of 2 ~ 5 m s^{-1}). It appears that the probability of $|\Delta S|$ tends to be flat after 3 dB, and the use of 3 dB can ensure that 95.6 % of precipitation cases are well preserved (Figure A1). Therefore, 3 dB is used in this study. If a larger threshold is employed, we expect more clutter signals will be mislabeled as precipitation."

2. $PDF_{thresh} = PDF_{median} + PDF_{SD}$ in Fig. 7 (revised manuscript).

   In the revised manuscript, we have clarified this point in Appendix B. By varying different α in $PDF_{thresh} = PDF_{median} + \alpha PDF_{SD}$, we show that a value around 1 is a reasonable value for α. Please see the details in the revised manuscript.

3. All methods are illustrated using rain cases. How would these methods work under other conditions? For example, would the clutter-filtering algorithm still be able to discriminate between a thin liquid layer cloud with highly variable reflectivity and non-meteorological targets? I would expect that the performance in the statistical sense changes and I want to know how, before I apply the proposed method. Also, it is hard to say how well the side-lobe mitigation algorithm would perform in solid precipitation because there will be no clear separation between the sidelobe and meteorological signal as in case of rain right above the melting layer.

This Ku/Ka-band radar system is deployed in Southern China, and no snowfall observations have been recorded yet. Therefore, we cannot give an assessment on other conditions. In the revised manuscript, we have stated this point in the Summary.

"The presented methods mainly deal with the challenges in observing stratiform rainfall events in Southern China, given the weaker signal attenuation at both bands compared with that in convective precipitation. We are aware that cloud radars have proven to be an effective tool for snowfall observations (e.g., Kollias et al., 2007; Li et al., 2021), the applicability of the presented framework in snowfall is yet clear despite that the sidelobe contamination in snowfall is not as significant as that in the presence of melting layer."

Regarding the applicability of the clutter removal method in clouds with highly variable reflectivity. We have added the following discussions in Section 3.1.

"In addition, for clouds with highly variable reflectivity, the presented algorithm may mislabel them as clutter according to our assumption that meteorological signals are coherent in a round of observation (28s)."

4. In the case of a novel processing technique with a number of subjectively chosen parameters, I would at least expect a comparison to a reference radar which does not

have artefacts in measurements (e.g. a magnetron-based cloud radar).

We do not have magnetron-based cloud radars working at the observation station, but there is a collocated C-band frequency modulated continuous wave radar (FMCW) radar. The C-band radar's data products include reflectivity, Doppler velocity, and spectrum width. In the revised manuscript, we have added the comparison of spectrum width with C-band radar observations regarding the effect of sidelobe mitigation. Please see details in Section "5.2 Comparison with a C-band radar".

5. Since the authors mention that there are alternative techniques available to mitigate side-lobes. I would also expect a comparison of the proposed methods with the available one.
Another sidelobe mitigation method is based on the theoretical power of the sidelobe to set the threshold for sidelobe identification. If the echo of the main lobe is detected correctly, then we can calculate the theoretical sidelobe power by knowing the peak sidelobe ratio. But in fact, the precipitation echoes are not isolated targets, a range gate can receive range sidelobes from several other gates at the same time. Therefore, it is difficult to remove all the sidelobes with a fixed threshold, which sometimes requires many rounds of operation.

In the revised manuscript, we have added the comparison to the threshold method, please see details in the last paragraph of Section 3.2.