General Comments:

I appreciate the significant contribution this work makes to radar remote sensing and its potential to enhance the assimilation of radar observations in NWP models. While the radar equations appear to be sound, I have some concerns regarding the use of NWP profiles for evaluation in this context. There are noticeable discrepancies between the simulations and observations, yet the authors seem to overlook these differences, suggesting that there is good agreement, despite the figures indicating otherwise. Additionally, the text would benefit from revisions for clarity and consistency, as some sections can be challenging to follow.

Page 2 L38: Some recent CRTM references would be more suitable here, including:

https://doi.org/10.1175/BAMS-D-22-0015.1

https://doi.org/10.1109/TGRS.2023.3330067

Page 3 L70: you can still see bright band in CloudSat CPR frequencies, e.g., see https://doi.org/10.1109/TGRS.2023.3330067

P5 L130: 30 minutes seems too high for cloud and precipitation related collocations. Any comment on how this would impact the results?

P6 L138: do you also interpolate when there is gap in reflectivities? That can be quite problematic.

P6 L146: “set of specific number of hydrometeors”: do you mean ensemble of hydrometeors?

P6 Equation: I am confused by fraction “f” – isn’t that already being represented in the water content values? Is this the maximum overlap probability? We are looking at individual layers when calculating the reflectivity so why would we need to worry about maximum overlap?

On Page 9, Line 225, and in the last paragraph on Page 11, the text is difficult to understand. Overall, the manuscript would benefit from editing for clarity and language.

P14 L279: Please rewrite this paragraph for clarity.

P14 L280-300: it states around L280 that “overall the spatial structure of simulated cloud is well …”. I don’t really think so. It clearly shows that the structure of clouds in simulations and observations are quite different. Again, around L288, it states the same for vertical structure of clouds but again I disagree with the statement as there is clearly a large

discrepancy between vertical structure of simulations and observations. This is likely due to error in input profiles.

P14 L292: “(e.g., spherical …)” I think the role of input profiles is extremely important here and should be emphasized

P14 L297: this should be better discussed and how it impacts the results. The NWP profiles may not be even suitable for this kind of evaluation studies.