

Reviewer 1:

This is relatively simple paper that describes a software tool to emulate EarthCARE or CloudSat measurements given ground-based, airborne, and simulated radar reflectivity and Doppler. I only have a few minor comments below to address before publication.

With this we thank the reviewer for his/her work and the suggestions made to improve our manuscript. In the following, we answer the comments and explain the changes. Please note that some answers given refer to changes made in the manuscript. If so, the explanation given in the text is short and emphasis is given on the improvements made in the text

Line 73: *'If the input radar data are from a 35 GHz radar system, then, the technique described in Protat et al. (2010) is used to convert them to 94 GHz'*. This is important. Please describe the method at a high level at least.

A longer description is added in the text, see below or in the updated Manuscript.

“...The assumption of the transformation relies on an assumption about the mass–diameter relationship of ice particles used in the Mie scattering computations. The disparity in radar reflectivity between 35 GHz and 94 GHz begins to exceed 1 dB when the 35 GHz reflectivity reaches approximately 0 dBZ. In most cases, the 35 GHz radar ice reflectivities fall below 0 dBZ. Therefore, any uncertainty arising from this approximation is deemed insignificant (Protat et al., 2010; Kollias et al., 2019). Also, the same dielectric constant ($|k|^2 = 0.75$) is used to estimate radar reflectivity (Z_e). This step is done to match the satellite configuration. This is mainly used for the ACTRIS data sets and will be applied during the data preparation of orbital radar. “

Line 85: *'As a result, the surface-up and spacedown view of strongly attenuating cloud and precipitation systems is very different and the comparison of these views using Orbital-Radar is not recommended.'* Are these columns flagged in the output?

The code does not contain any flags related to the attenuation of input radar data or synthetic CPR. Additional data from synergistic instrumentation must be used to estimate the influence of liquid attenuation. Better information was added to the manuscript to clarify this. See the edited text below or in the updated manuscript.

“... Since the tool only has the Z_e and V_m fields as input and uses no additional data or retrievals a flagging of cases with high attenuation due to liquid droplets or precipitation is not provided. Such filtering has to be done using additional information, such as Cloudnet target classification or the liquid water path (LWP) by a parallel measuring microwave radiometer. If the input data are from a ground-based radar system, they should be restricted to cases with limited attenuation, such as ice clouds and shallow systems. Nevertheless, the filtering of the data depends on the user of the data sets and might be individual and has to be specified when using the data further.”

Line 119: *'Thus, a fixed value of 52 dB is used.'* Are you assuming $\sigma_0 = 52$ dB or that the reflectivity factor is 52 dBZ? This is inconsistent with the table.

The manuscript was updated to clarify this. See the edited text below or in the updated manuscript.

"... . Thus, a fixed value of $\sigma_0 = 52$ dB is used. However, the user can change the value depending on the regional statistics of σ_0 or for overseas scenes. The reflectivity value of the surface echo is simulated by introducing a ground echo into the original measurements. ..."

Line 187: Bad grammar and duplicated sentence. *'Finally, these two error terms are combined to estimate the total CPR Doppler velocity uncertainty These two terms are combined to provide the total CPR Doppler velocity uncertainty std(VDOP).'*

Thanks for this hit. The sentences were rewritten.

"... . Finally, these two terms are combined to provide the total CPR Doppler velocity uncertainty $\text{std}(V_{\text{DOP}})$ "

Line 204: *'The MS flag calculation is based on the method from Battaglia'*. Again it's OK to cite but describe at a high level how this works.

As for the correction method above, an improved description was added to the text; see the updated manuscript.

"... . The MS flag calculation is based on the method from Battaglia et al. (2008). The MS flag using thresholds for calculating MS is present within the column. The thresholds were estimated using Monte Carlo reflectivity simulations for multiple cloud scenes and validated using CloudSat data. EarthCARE also operates at w-band, so we adopted the method, and so the flag highlights all bins in which MS plays a role. The calculation uses an MS scattering threshold of 12 dB or if the integration of the pixels from the top exceeds 42 dB. The flag highlights the profiles affected by MS and provides help for the interpretation of the data. ..."

I suggest that a table is added that lists all of the variables included in the output files.

The table describing all the output data of the orbital-radar is implemented as an appendix to the paper.

" ... 3.1. Simulation of synthetic CPR data

This section describes the processes depicted in the central dashed box in Figure 1. All technical specifications of the EarthCARE and Cloudsat CPR mentioned below are listed in Table 1. A table of all variables written in the netCDF output file is presented in the Appendix A, Table A1. ..."