RC1: 'Comment on egusphere-2022-1284', Anonymous Referee #3

Review of: Processing reflectivity and Doppler velocity from EarthCARE's cloud profiling radar: the C- FMR, C-CD and C-APC products, Pavlos Kollias et al.

Overall Recommendation: Publish with minor changes

The authors would like to thank the reviewer for their useful and insightful feedback. A point-by-point response to the reviewer's comments is provided below.

Specific Comments:

- Line 21: Is it a good idea to mention a launch date within the paper?

We agree with the reviewer that typically (and particularly in the case of the EarthCARE mission that has been delayed for more than 10 years) is not a good practice to mention a launch date. However, at this point, there is high level of certainty within ESA that the EarthCARE launch will take place in 2024.

- Line 52: Maybe mention already why this frequency varies and in which way (intentionally, technically,...).

The revised manuscript was modified as follows to address this (lines 55-58):

"Low PRF is used in the tropics and subtropics where the troposphere is deeper (18-20 km) and we need to space far apart in time the CPR pulses to avoid second trip echoes. At higher latitudes, the troposphere is shallower (10-12 km) and a higher PRF is possible. The PRF setting is very important since it determines the number of samples available for integration and affect the quality of the Doppler velocity measurements (Kollias et al., 2014)."

- Line 70: A lot of a-priori knowledge is assumed. Estimation from autocovariance could actually be considered mathematical trivial, but a reference to a paper highlighting the technique would be really fruitful at this position. Actually, this technique only works if spectral leakage is avoided (i.e. the spectrum is fully and unambiguously recorded). So it should at least be shortly mentioned that it actually is applicable in the presence of all the adverse effects on the velocity measurement (NUBF etc...) and that it is representing the actual spectral width of the final velocity spectrum.

The revised manuscript was modified as follows to address this (lines 74-76):

"*The lag 0 and lag 1 autocovariance estimates are used for the estimation of the CPR Doppler moments using the pulse-pair moment estimator technique (Doviak and Zrnic, 1993).*"

Doviak, R. J. and Zrni´c, D. S.: Doppler Radar and Weather Observations, Academic Press, 1993

- Line 164: dBZint: please specify if this represents integrated Z values or the integrated linear values. I'm questioning if it is really necessary to define a new unit (dbZint) if a representation in actual physical units would be available.

We remove any reference to the dBZint parameter in the revised manuscript.

- Figure 4: The classification of "Strong MS" is retrieved for areas where there is no signal in the ideal simulation (at around 2700km below 5km). It should be noted in the figure that it depicts the multiple scattering influence on the measured values and not the multiple scattering originating at the given location. This disambiguation is implicitly made in the text, but it should also be contained in the figure.

The revised manuscript was modified as follows to address this (lines 183-185):

"*While the MS occurred above the height where I(z) exceeds 41 dB, its impact on the CPR observables is negligible above that height. The MS flag shown in Fig. 4c indicates the CPR ranges where the MS has a significant effect on the CPR observables.*"