



EGUsphere, referee comment RC2
<https://doi.org/10.5194/egusphere-2022-1284-RC2>, 2023
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Comment on egusphere-2022-1284

Matthew Lebsock (Referee)

Referee comment on "Processing reflectivity and Doppler velocity from EarthCARE's cloud-profiling radar: the C-FMR, C-CD and C-APC products" by Pavlos Kollias et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-1284-RC2>, 2023

Reviewed by Matthew Lebsock

This paper describes three radar-only algorithms for the upcoming EarthCARE mission. The algorithms presented include a vertical feature mask, a Doppler correction product, and a pointing characterization product. The presentation is technically correct and relatively straightforward. The paper will provide an important citation for the at-launch product suite. I have only minor revisions regarding a few details of the presentation and some missing citations.

Line 25: add 'Cloud Profiling Radar' or 'radar' after CloudSat.

Line 25: change 'compare' -> 'compared'

Section 2: It would be useful for many readers to understand the relationship between the three algorithms described here within the larger suite of EarthCARE products. Can an algorithm flow chart be incorporated? Or at least in words described?

Lines 93-95: The non-expert reader is not going to know what you are referring to. Add wording to the effect of 'beneath the convection near 4100 km'.

Line 112-114: Mention the small temperature dependence.

Line 114: Cite Lebsock et al., 2011 <https://doi.org/10.1175/2010JAMC2494.1>,

Lines 122 and 123: Is it X-MET or X-Met?

Lines 140-145: Lebsock and Suzuki, 2016 (<https://doi.org/10.1175/JTECH-D-16-0023.1>) discuss the errors in this approach including (1) attenuation by undetected clouds, (2) systematic differences between water vapor in clear and cloudy columns, and (3) non-uniform beam filling (NUBF). The first two are small for the shallow subtropical cumulus clouds where this approach is best implemented. NUBF errors can be significant.

Section 3.2 Regarding Non-uniform beam filling errors for PIA - Even if you estimate a perfect PIA (averaged over a footprint) you have to translate that PIA into a TWP. The NUBF changes the relationship between PIA and TWP which can introduce significant errors. I understand the product won't produce a TWP but this limitation in the utility of PIA for deriving TWP deserves mention somewhere in the PIA section.

Section 3.2 You should mention somewhere in this section that MS signals frequent in stronger precipitation are often going to bias the PIA estimate low.

Line 154: Cite MS model.

Line 169: '?' as a reference.

Section 4.1.2: This section is too general. You don't describe the specific EarthCARE algorithm. Can you provide some details here on how you do the unfolding?

Line 341 add '()' around 'Fig 6a'

Line 432: add 'than cloudsat cpr'