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Atmospheric Measurement Techniques Discussions

Interactive comment on "Mind-the-gap part I: Accurately locating warm marine boundary layer clouds and precipitation using spaceborne radars" *by* Katia Lamer et al.

Anonymous Referee #1

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This study makes use of a long deployment of extremely sensitive ground-based ARM radar to provide new and important insights into the factors limiting the detection of warm marine boundary layer clouds by CloudSat. By considering the independent effects of the radar pulse response function, sensitivity, field of view, vertical oversampling, and pulse length, the authors provide important comparisons between the performance to be expected from future EarthCARE and NASA ACCP cloud profiling radars. This work both improves our understanding of existing and widely used CloudSat datasets, and will help in the preparation for future cloud radar missions.

The manuscript is logically structured and clearly written. Subject to a few corrections

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Discussion paper

for clarity, I recommend this manuscript for publication in Atmospheric Measurement Techniques.

Specific comments:

P1, L10: not sure if there is a word missing, or just that the word after the semi-colon shouldn't be capitalised.

P1, L16: it's clear to me what you mean, but "shortening" surface clutter is an awkward phrase.

P4 L101–103: this sentence is hard to parse, and could do with restructuring or perhaps replacing the em-dashes with commas. Something like, "... information from CloudSat-CPR to evaluation the performance of current spaceborne sensors in this regime (Section 2.1), ARM measurements used as a benchmark (Section 2.2), and how we forward-simulate..."

P4, L107: referring to CloudSat making observations "twice a day" or "once a day" is misleading; this refers to the day-time and night-time parts of a CloudSat orbit, of which there are many each day.

P5, L160–164: is it possible to use KAZR measurements to comment on how conservative (or aggressive) this approach to clutter filtering is? The argument is made in the conclusions (P15, L518âĂŤ520) that improvements are possible, but I couldn't find (and this may easily be my oversight, and if so I apologise) where this was stated in the results section.

P7 , L212: the word after a semi-colon shouldn't be capitalised.

P8, L249: When discussing times it is clearest to state that all times are in UTC, but also provide important information about local time so we know what to expect with respect to the diurnal cycle.

P8, L258: remove "both"

P10, L317: If I understand the caption of Fig. 5 correctly, CloudSat-CPR is shown by a royal blue line.

P11, L373: should read "...a factor of 0.5 times the pulse length..."

P13, L436: should be Fig. 6c

P14, L474–3: should be something like "...warm marine boundary layer (WMBL) clouds and precipitation, and spaceborne radars' ability to characterisze them, is..."

P14, L485: should be "...such that..."

P14, L491: remove "both"

P15, L505: "...length of its hightly sensitive pulse..."

P16, L546: remove "study"

P17, L583: should be Fig. 5b

P17, L589, should be "...this secondary lobe is confined..."

P22, L728, Figure 1: should be "...ground-track taken in $\sim$7 minutes is shown..."

Figure 1: I (a color-blind reader) have a lot of difficulty distinguishing the blue dots in Figure 5b from the underlying radar reflectivity (also blue). Since they are not on the same subplot, would it be acceptable to make these dots black as well?

Figure 1: To make clear the fact that the KAZR and CPR data are on different time-series, it may be useful to mark the time of the CPR overpass with a vertical line on the KAZR timeseries. This would also aid comparison of the cloud fields at the same time.

Figure 2: The y-label "factors of the pulse length" is unclear; the label and the sign convention should make it very clear which is the "leading edge" and the which the "trailing edge" of the radar pulse in the direction of propogation.

P24, L745–748, Figure 3: In the text is seemed clear that these values (e.g. hydrom-

eteor cover) are fractions of profiles excluding those containing high, mid- and layered clouds. If so, best to re-state this in the caption.

Figure 4: It may again be useful to show the time of the CloudSat overpass on the KAZR timeseries.

P26, L 766, Figure 5: should be “...located below a certain height.”

P28, L795, Figure 7: “...which is CloudSat operating with...”

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