Manuscript: EarthCARE Cloud Profiling Radar Observations of the Vertical Structure of Marine Stratocumulus Clouds – Point to point response to reviewer 3 comments

We are grateful to reviewers for their insightful comments, which have helped us improve the clarity and impact of our study. In the remainder of this document comments from the reviewer are in black and our responses are in red.

This paper examines the new EarthCare cloud profiling radar (EC-CPR) compared with the earlier generation CloudSat CPR in marine stratocumulus regions of the Southest Atlantic and Southeast Pacific.   Additionally, the use of a steady state cloud and drizzle model is used to examine how the EC-CPR observed clouds compare with theory. Comparisons to measurements collected by the ER2 are also used. I find the paper to be very well done and informative. I especially found the discussion of the PTR to be illuminating. I suggest the paper be published after minor revisions.

I think the authors should consider a minor reorganization of the paper by putting all the cloudsat comparisons in the earlier portion of the results section and comparisons with the cloud model and new results from EarthCare later. Specifically, I was surprised to find section 3.2 where it was since the cloudsat comparisons were all earlier in the paper.

We put Section 3.2 at the very end is because we'd like to use the model simulations in the earlier sections to illustrate the impact of point target response on the shape of reflectivity profiles and the location of Zmax and resultant impact on drizzle detection. The comparison of cloud fraction is presented at the beginning is because it is not affected by the vertical structure of the radar reflectivity profiles.

My only significant criticism is that the authors need to examine, at least briefly, the cloud controlling dynamics of the two periods 2023-4 and 2007-8.   Given the well-documented changes in global low cloud cover over the past decade, it may well be that the clouds in the SEP and SEA regions have real differences between the periods examined. Furthermore, since both observing systems include lidars, a comparison of cloud occurrence including the lidars in the two regions would provide information on these issues as well.

This is a very good point. We added discussions about how the differences regarding large-scale circulation, SSTs and inversion strength in 2023-4 and 2007-8 could impact the cloud fraction and drizzle amount qualitatively. We will incorporate lidar observations in our future work.

Despite the weak La Nina forcing together with the abnormally warm SSTs in 2024-5 are inclined to cause modest decrease of Sc cloud fraction in the more offshore regions, EarthCARE detects overall higher cloud fraction due to its enhanced capability. In terms of drizzle, the slightly weaker inversions and warmer than average SSTs in 2024-5 tend to favor deeper boundary layer and more mixed stratocumulus-cumulus clouds that carry larger liquid water path more ready to rain, whereas the colder SSTs combined with strong inversions in 2007-2008 favor overcast Sc with overall less precipitation.

Minor comments:

- Figure 1: should note in caption and figure titles that cloudsat CPR is for a different period - 2007/8.

Data period of CloudSat CPR is added to the caption.

- Line 119: should acknowledge and cite the lidar-radar cloud product of CloudSat.

References for CloudSat and CALIPSO data are added.

- Figure 4: This figure needs to be displayed in latitude longitude coordinates instead of km along track. Because the tendency of the casual viewer is to compare cloudsat with EC, the panel titles should clear show the dates that the data were collected.

Date, longitude and latitude are added on each panel to avoid the potential confusion that EarthCARE and CloudSat observation are collocated. We prefer to keep the x axis as it is to better illustrate the different sampling resolution of the two sensors.

- Figure 5: Need to include latitude and longitude information in the figures and/or the caption.

Latitude and longitude information is added to the caption.