Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., referee comment RC1
https://doi.org/10.5194/amt-2022-80-RC1, 2022

Comment on amt-2022-80

David Winker (Referee)

Referee comment on "Impact of the revisit frequency on cloud climatology for CALIPSO, EarthCARE, Aeolus, and ICESat-2 satellite lidar missions" by Andrzej Z. Kotarba, Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2022-80-RC1, 2022

This paper examines whether the impacts of sparse sampling from a nadir-viewing satellite lidar varies with the revisit time of the satellite orbit. Orbits of several different existing satellite lidars are chosen as examples. Parameters of interest are cloud amount, cloud top height, and cloud optical depth. SEVIRI cloud retrievals are taken to be truth. Lidar sampling errors are then simulated by sampling SEVIRI retrievals along the ground tracks of the various lidars. Lidar sampling error is measured by the difference between statistics based on SEVIRI retrievals sampled along the orbit track of each of the modeled lidars and SEVIRI retrieval statistics sampled by a hypothetical lidar with one day revisit time.

The paper is well organized and clearly written, for the most part. I have one major concern and a few specific comments.

My major concern is that Section 3.3 and Section 4 (Table 4) seem to come to opposite conclusions. Section 3.3 shows that shifting the initial day of the CALIPSO 16-day orbit cycle (essentially, shifting the orbit tracks observed on a given day) can be a major source of uncertainty. On the other hand, Table 4 shows that at the annual scale, with 10x10 grid cells, accuracy requirements can be met for most locations. Are all the results in Table 3 for 1x1 degree grid cells? Figure 5 shows that sampling uncertainties decrease when size of the grid cells increases but the uncertainties seem to be larger than what is indicated by the results in Table 4. But the metrics shown in the two sections are different and difficult to compare. Are results in the two sections consistent or do results in Table 4 ignore uncertainties due to initial day of the cycle? Please explain.

Minor comments:

I did not find the latitudinal extent of SEVIRI CLAAS dataset in the text. Figure 2 seems

to show the CLAAS data extends from about 70S to 70N. This is important to mention in the text, to make clear that lidar sampling of the high Arctic is not being evaluated in this study.

Line 133 states that Aeolus is in an equatorial (0-degree inclination) orbit. This is not correct. Aeolus is in a 97-degree inclination orbit.

In Section 3.3 it is not clear what grid cell size is used in generating the statistics which are reported. Other than Figure 5, do all statistics refer to 1 degree grid boxes? What grid cell size is shown in Figure 5 c, d, g, and h?

Line 432: "spatial resolution above 10 degrees" is ambiguous. Does this mean "spatial resolution better than 10 degrees" ?

Line 438. Please explain why confidence intervals are preferred over means and medians in this circumstance. Also, provide a reference on how to compute confidence intervals.