

Atmos. Meas. Tech. Discuss., author comment AC1
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Reply on RC1

Karolina Sarna et al.

Author comment on "Estimating the optical extinction of liquid water clouds in the cloud base region" by Karolina Sarna et al., Atmos. Meas. Tech. Discuss.,
<https://doi.org/10.5194/amt-2020-504-AC1>, 2021

Response to Anonymous Referee #1

- *"Only minor changes and a few typographical corrections are needed before the manuscript is ready for publication. Lidar characteristics (range resolution, field-of-view, etc.) from the EarthCARE simulator should be provided briefly in Section 3. Even if it matches what is presented in Donovan et al. (2015), a short overview is warranted here. One can gather from the tables that 15-m range resolution was used, but it should be explicitly stated."*

Response:

It is understood that the description needs to be reviewed. More detail on the dataset and on the specifics of the instruments used for the simulation will be provided in the reviewed version of the manuscript.

- *Secondarily, the use of accuracy, as defined in the manuscript, is somewhat misleading and almost redundant given the percent error is already provided. What connotation does the reader get from retrievals that are over 100% accurate? In such cases the percent error is the more meaningful measurement of the quality of your retrieval. To be fair, the ratio between the retrieved and simulated values has some usefulness. But in context of "accuracy", we get more from the percent error.*

Response:

This is a fair comment. The main idea was also to provide the deviation from the simulated values of the retrieved ones. This can be changed into a ratio in the revised version of the manuscript.

- *Specific Comments*
Page 2, Line 8: Though it is stated in the title, distinguish that "lidar can penetrate only a small part of a cloud, typically 100 to 300 meters" refers specifically to liquid water clouds.

Response:

Indeed, this will be specified explicitly in the revised version.

- *Page 5, Line 16: angels should be angles*

Response:

This will be corrected.

- *Page 6, Lines 8 – 12 or Page 7, Lines 5 – 10: In most cases, Figure 4 and Table 2 show the multiple scattering correction improves the extinction retrieval; however, from 75.0 – 90.0 m or 1.8, the single scattering solution has a smaller error. Some comment/explanation to this point should be included.*

Response:

It should be noted that the single scattering solution is applied to a data that was simulated without the multiple scattering, hence indeed when the cloud optical thickness is higher (or simply with the increase of the altitude within the cloud) the solution has a smaller error as the contribution from the multiple scattering is not increasing as it would be in an actual cloud. The use of the simulations only with the single scattering is presented here to show that even if there were no multiple scattering occurring in the cloud, the resolution correction is still valid and can improve the retrieval. This will be explained better in the revised version of the manuscript to underline what are the differences between different simulated signals.

Caption of Figure 4 will emphasize that both single-scattering and multiple scattering signal is simulated in the corrected version of the manuscript.

- *Appendix Page 10, Line 6: therms should be terms*

Response:

This will be corrected.

- *Appendix Page 10, Line 16: Here difference is likely referring to the ratio, instead*

Response:

This will be corrected.