

Atmos. Meas. Tech. Discuss., referee comment RC1
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Comment on amt-2020-504

Anonymous Referee #1

Referee comment on "Estimating the optical extinction of liquid water clouds in the cloud base region" by Karolina Sarna et al., Atmos. Meas. Tech. Discuss.,
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Estimating optical extinction of liquid water clouds in the cloud base region
Sarna et al.
Atmos. Meas. Tech.

General Comments

The authors describe a method to obtain the cloud extinction of water clouds from elastic backscatter polarized lidar measurements based on the Klett inversion. Simulated lidar retrievals are used from the EarthCARE simulator adapted to transmit in the zenith direction. The corrections for range resolution and multiple scattering effects are described, in great detail, along with demonstrations to show how the corrections improve the quality of the extinction retrieval.

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. Secondly, 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.

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.

Page 5, Line 16: angels should be angles

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.

Appendix Page 10, Line 6: therms should be terms

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