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Atmospheric Measurement Techniques Discussions

Interactive comment on "Aerosol backscatter profiles from ceilometers: validation of water vapor correction in the framework of CeiLinEx2015" *by* Matthias Wiegner et al.

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We thank Chengcai Li and Tianshu Zhang for reviewing our manuscript and their useful comments. Due to Christmas vacations and New Year our replies are delayed by approximately two weeks.

We have included our replies to each of their comments and attached the revised version of the manuscript for tracking the changes we made. They are highlighted as displayed by latexdiff. Our replies to each comment of the reviewers are given below (in italics).

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Discussion paper

Replies to Chengcai Li's comments

[...] The paper is clearly written. Overall, this is a nice paper and well conceived effort of value to the community of atmospheric measurements. I suggest its publication on the journal of AMT after some technical corrections revised by the authors. No extra data or processing are needed. From a general aspect, I would suggest to shorten the paper a bit, for example "The validation range" and "the results parts".

→ *Thanks for the positive overall evaluation. According to the suggestion we have gone through the paper and have shortened or deleted several sentences whenever it seems that they are not necessary to understand the text. A few typos have been corrected as well. The changes are highlighted in the attached revision of the paper.*

Page 3, Line 4, "measurements of a CYY-2B ceilometer (CAMA) that was deployed in China were reported", here, the reference is missing.

→ *These measurements are reported by Liu et al. (2018). This reference is already given on page 3, line 16. As no other references could be found in peer-reviewed journals and because that paper summarizes the technical specifications of the instrument we have added the same reference again.*

Some legends should be added on the figures, for examples, Figure 1 - 7, 10-12, 14-16, 18 and 19, to describe the colored lines or circles for being easily understood, instead of only describe in the texts.

→ *We agree with the reviewer's suggestion that the lines, colors and symbols should be found without the need to scroll through the paper. For this reason we had included all relevant definitions in the caption of the corresponding figure. That*

leads indeed to a certain degree of complexity and could be confusing. So we have added legends whenever sufficient space was left in the figures and overloading could be avoided. The following changes were made:

Figs. 1, 2, 5, 6, 7, 12, 15, 16, 18: legends were added.

Figs. 10 and 14: in the left panel the color of lower labels was changed from black to red (so it is more intuitive how labels and lines belongs together), and a legend was added to the panel in the center.

Fig. 11: the colors were changed to have a clear relationship to the wavelength. A legend was added.

Fig. 19: a legend was added and the vertical scale was changed to better see the differences of the curves.

Figs. 9, 13, 17: changed as described below.

Figs. 3, 4 were left unchanged as we believe that they are already quite concise.

It is not necessary to show the low signal to noise ratio parts in the high free atmosphere on Figure 9, 13, and 17. My suggestion is to shorten the vertical height to 3.5 or 4.0 km to present the images more clearly.

→ *We had the same intent as the reviewer: for this reason we did not show the full vertical range (i.e. ≈ 15 km) but only 7 km. To enhance the visibility of the internal structure of the aerosol layers we have used a color code that is based on the histogram of Pr^2-values; each color represents the same number of "pixels". Doing this, the structure is pronounced and the image "looks nice" as the contrast to the free (almost aerosol free) troposphere is obvious. This gets lost if we drastically reduce the vertical range to 3.5 km or 4.0 km. As a compromise we applied 5 km (actually 5.1 km for technical reasons) as upper limit of Figs. 9, 13 and 17 in the revised version. We are confident that this is acceptable for the reviewer.*

Replies to Tianshu Zhang's comments

[...] The paper is well written, validation of water vapor correction is discussed in extensive detail. The paper is clearly relevant and appropriate for publication to AMT. I recommend the paper for publication after technical corrections.

→ *Again we appreciate the positive rating of our study.*

Online wavelength may drift with temperature, as mentioned at Page28, Line5. CL31/51 have a wide bandwidth receiving optical filter (36nm@50% pass band according to CL31/51 manual) to adapt to wavelength drift within the operating range of -40 to 60 degree C. In order to be perfect, I would suggest that the author should give the temperature adaptation range of the correction for the ceilometer without temperature control.

→ *The reviewer is right. This is indeed an important detail that should we reported in the manuscript, in particular, as this is different to the Campbell ceilometers. Accordingly we have included this information in Section 2, see page 4 of the revised version.*

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