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Atmospheric Measurement Techniques Discussions

Interactive comment on "The influence of the baseline drift on the resulting extinction values of a CAPS PMex" *by* Sascha Pfeifer et al.

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We would like to thank the Referee for the constructive comments.

Please find our response to each of the comments below:

The captions need to be substantially expanded to include more details of what are presented in the figures. Figure 2 misses the purple traces on the top panel, and is hard to interpret because the caption is inadequate.

Yes, this is right in some ways. The purple traces are present but not really visible because they do not differ from the new calculated baseline using this x/y-scaling.

We have revised the plot and caption. The values for the measuring period are displayed subtracted by the Rayleigh scattering value. The scaling for the plot with lastbaseline is therefore better. The values for baseline periods (as predictor variables) are more visible, as well as any deviation between the interpolated baseline and values for the measurement period.

Also, the proposed baseline correction method should be validated via simultaneous continuous baseline measurement before the authors can conclude that the corrected baseline represents the true values.

That's exactly what we did. As stated out in the article, a particle filter was installed upstream of all three instruments. This is nothing else than a permanent baseline measurement. Two identical devices with the same wavelength were not available and are not necessary with this approach.

Any method can be considered as sufficient if it results in a (noisy) time series closed to zero without any artefacts, when using a particle filter upstream a particle extinction monitor.

Let me emphasize again at this point: Only the data points of the baseline measurments were used as the input for the cubic spline. The data points of the measuring period were used as a test case, as reference value, which should be reproduced by the new method. This should also be noticeable with the revised plot.

More descriptions of the cubic smoothing splines are needed. What are the chosen parameters for each instrument, and how were the data during the missing baseline period interpolated?

This is a legitimate point of criticism (see also Referee 2). Of course, we will not explain the mathematical concept of cubic smoothing splines. The function that is used is referenced in the text. But you are right. The parameters that are used should be specified in more detail. We also add a short section for the limitation of this approach (see Referee 2).

For the case with 1 Hz sampling rate, a baseline period of 5 min, and a duration of 1 minute, the smoothing parameters used were 1.1, 1.3, and 1.4 for the blue, green and red, respectively. These values were determined by minimizing the artefacts of a separate test dataset.

We have revised the specific section:
"A free smoothing parameter ($spar$) must be chosen, which depends on many factors, e.g. baseline period and duration but also on sampling rate and device noise etc.. Therefore, a suitable parameter must be found for each individual device and application. For the case with 1 sampling rate, a baseline period of 5 and a duration of 1, the smoothing parameter used were 1.1, 1.3, and 1.4 for the blue, green and red, respectively. These values were determined by minimizing the artefacts of a separate test dataset. Alternatively it is also possible to determine a smoothing parameter automatically from the time series of baseline using for example the implemented generalized cross-validation method (GCV). The resulting values of the automatically calculated smoothing parameters using the GCV method do not differ significantly from the first method with values of 1.06 (blue), 1.25 (green) and 1.3 (red). Furthermore, all distinct data points with 1 sampling rate were used (all.knots=TRUE). All other parameters were set to default. A complete description of the function can be found in the R Documentation (R Core Team, 2013)."

Figure 1: are the gradually increasing baseline of the Loss signal at 530 nm between 9/21 and 9/26 due to contamination building up on the cavity mirrors? Why is it only

observable at the green wavelengths but not the other two? What causes the red loss signal to drift if it is not related to the NO2 level in the ambient air? These points should be thoroughly discussed in the text with great detail.

Indeed, the increase in the second week is interesting. Because a particle filter was used it can be concluded that this is not due to contamination by aerosol particles on the cavity mirrors.

The structure for red also looks interesting. But it should be noted, however, that the signal here only fluctuates by 3 Mm-1 within a week. This is smaller by several orders of magnitude. However, no further data are available for a detailed analysis. It is also somewhat inappropriate, since the focus of the article is more on the effects of variability on extinction values, rather than their causes.

We have added in the article:
"The steady increase of the loss of CAPS-green in the second week is significant. The reason for this is unknown. Because a particle filter was used, it can be concluded that this is not due to contamination by aerosol particles on the cavity mirrors."

Page 1 Line 6: where → were

We have replaced “where” by "were".

Page 2 Line 2: which only -> which not only

We have inserted “not”.

Page 3 Line17: The use of “carrier gas” is a bit confusing here. Change it to “ambient air”.

We have replaced “carrier gas” by "ambient air".

Page 4 Line 14: delete the duplicate “for the”

We have deleted the duplicate "for the".

Page 4 Line 17: I don’t see any “secondary plot” in Figure 4

We have deleted "secondary". We have also replaced "plot" by "results" in the next sentence.

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