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Atmospheric Measurement Techniques Discussions

Interactive comment on "Intercomparison of 15 aerodynamic particle size spectrometers (APS 3321): uncertainties in particle sizing and number size distribution" *by* S. Pfeifer et al.

S. Pfeifer et al.

pfeifer@tropos.de

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We thank the referee for the favourable comments, the emphasis of the most important points and the suggestions for improvements. In the following, you will find our comments to each point:

Given that the counting and sizing by the APS are so sensitive to flow rates in the aerosol and sheath flows a reference to the procedure used during the laboratory study for adjusting these flows would be valuable.

Unfortunately this procedure is not explained in the official manual. As far as we know, there is no free access to the internal manufacture information. This should be requested directly from the manufacturer. But we agree, in our opinion this aspect belongs to basic maintenance, so it should be made available for all users.

Can unit-to-unit variability, especially counting efficiency for particles less that 0.9μm be explained to some extent by analysis of the pulse pair types?

Yes, absolutely right! Unfortunately this was not the case during the workshop. The optical results from the correlated mode can also be an indicator for this effect. We have added this idea in the discussion section.

Page 11521, line 19
Furthermore, although no TOF-recalibration has been performed, the deviations in sizing were corrected roughly in a post-processing step. Describe this correction in more detail.

A description is already given at the beginning of the previous section 3.2.

Page 11521, line 26 and following paragraphs
The large unit-to-unit variability in the sub-micron range certainly results from individual differences in unit counting efficiencies. What parameter do you mean with respect to "variability"? Number- size distribution?

Yes, "number size distribution". We have reformulated this.

The term "detector error" needs explanation since the detector is an integrated unit of the APS consisting of optical sensor, laser source, optical components. The counting errors may be associated with low pulse height (detector sensitivity, flow alignment, optical alignment and cleanliness or laser beam focusing) or the pulse processing algorithms.

The term "detector error" was taken from Volcken and Peters (2005). We have reformulated the part:

The detector error is associated with low pulse height of the optical signals used for the TOF measurement. The effect can be divided into two types:

1. Just one of the two signals is lower than a certain threshold.
...

Either the general quality of the optics (cleanliness of the optical components, detector sensitivity, laser beam focusing, etc.) or the precision of the alignment of the aerosol flow and the laser beam could be a reason for this variability.

Page 11524, line 9
Was there any significant difference in counting efficiency (variability) and lower acceptable useable size range between units for PSL vs. ammonium sulfate vs. ambient aerosols that you could evaluate?

As mentioned, there was a slight increase of the lower acceptable size range from ammonium sulfate to ambient aerosol. In the context of the pulse height, we assume

the effect is rather a function of the optical diameter than the aerodynamic diameter. That means, the "darker" the particles are, the more likely the effect occurs already for larger particles.

Page 11519, line 18
Was the sense of the change in sizing consistent with the change in acceleration flow rate? (It was in my quick analysis.) Were the flow adjustments great enough in magnitude to affect the sizing deviations by the amount observed?

Yes, for ICPF A and B. It was absolutely consistent for both cases.

All the minor changes to text, were adopted as suggested.

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 11513, 2015.