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Atmospheric Measurement Techniques Discussions

Interactive comment on "Design and performance of a three-wavelength LED-based total scatter and backscatter integrating nephelometer" *by* T. Müller et al.

T. Müller et al.

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Reply to J. Ogren

Comment: An additional comment... the TSI neph is referred to as model 3565 in several places in the text, whereas the correct model number is 3563.

Reply: The model number will be corrected throughout the manuscript.

Comment: An a comment on a point that Darrel raised in his review... the light source in the Radiance Research neph uses a flash lamp, not an LED.

Reply: Thanks for confirming.

Comment: I suggest that you include a disclaimer concerning the presence or absence of financial support from Ecotech for doing the work at IfT.

Reply: A disclaimer will be included.

Comment: The paper is much more about the performance of the neph, rather than its development. You could remove "Development and" from the title and not lose anything.

Reply: The authors thanks for the comment. The title was changed.

Comment: Table 3 in Anderson & Ogren gives the measured noise of 7 TSI nephs on filtered air, which is the same approach as you used in section 4.1. When you discuss noise in the Ecotech neph, though, I think that you need to include the settings of the internal Kalman filter when you did the measurement.

Reply: The nephelometers compared in this paper use different filters. A discussion of the Kalman filter of Aurora would necessarily require a discussion of the sliding averaging used for the TSI nephelometer. The authors think that a detailed discussion of the internal filters would make the manuscript more unreadable. The manuscript describes the nephelometers as they are without going into details of the electronics and internal data processing. Besides that, the internal settings of the filters, except averaging time, can not be changed by the user. Anyway, the authors will include the information, that different filter are used.

Comment: You should be able to do a closure calculation with the ammonium sulfate lab tests. I have found over the years that the closure results in the TSI neph characterization paper are a really simple and convincing way to demonstrate to an audience that the instrument really works as we think it does. I suggest that you include a closure calculation in your paper, which would include your measured angular and wavelength response functions.

Reply: Indeed a closure experiment is relatively simply but good tool to show that an experiment worked well, although the authors tend not to show a closure for following reason. Many closure experiments with TSI nephelometer were published in the last years. For example in Heintzenberg et al. (2006) it was shown that calculated and measured scattering coefficients agree within about 6% for the green channel. In the present study differences are smaller than 4% for the green and blue channels. Larger deviations for the red channels are discussed in the answer to D. Baumgardners comments. Thus it is not expected that a closure provides usefull information to this study.

Comment: Ecotech neph users are going to be knocking down your doors for a simplified correction scheme for truncation/illumination errors. It would be very useful if you would evaluate the feasibility of the Anderson&Ogren scheme for estimating the correction factors for the Ecotech neph using the measured Ångström exponents. If the approach is feasible, I suggest including the parameters for the correction equations in your paper.

Reply: The authors followed the suggestion and developed a similar correction scheme as described in Anderson&Ogren1998. In the reply to anonymous referee #2 two plots are shown. Truncation correction functions for TSI and Ecotech nephelometers were compared. Figures, table and discussion will be included in the revised manuscript.

Comment: Finally, I think that neph users would find it useful if you reported a few other measured characteristics of the Ecotech neph compared with the TSI neph: – temperature rise of the sample air, and resulting RH reduction; – wavelength distribution of the light source; – effective volume (c.f., Bergin et al, ES&T, 1997); – response time (with and without the Kalman filter).

Reply: The authors will add the wavelength distribution to the instruments specifications. The temperature rise depends on many parameters, e.g. the flow rate and how the nephelometers are ventilated. Many instruments used for measuring scattering at ambient or controlled humidity were modified, e.g. Heintzenberg and Erfurt (2000) and

Schmidthauser et al. (2010). The authors think that it is too simple to give temperature differences at the inlet and outlet without a detailed discussion. An investigation of temperature and humidity effects inside nephelometers is worth to be another investigation. The authors will give the temperature increase and a brief discussion in the revised manuscript. A detailed investigation on temperature and humidity effects cannot be given. The effective volume and response time are important for applications which require a high temporal resolution. Similar to the temperature rise, an investigation of this effect requires more experiments, which were out of the focus of this manuscript.

The authors will summarize the characteristics, e.g. wavelength distribution and temperature rise, of both nephelometers in a table.

Interactive comment on Atmos. Meas. Tech. Discuss., 3, 4835, 2010.