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Atmospheric
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Discussions

Interactive comment on "Measurement of relative humidity dependent light scattering of aerosols" *by* R. Fierz-Schmidhauser et al.

R. Fierz-Schmidhauser et al.

rahel.schmidhauser@psi.ch

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We thank Anonymous Referee #3 for his valuable comments and suggestions, which certainly helped us to improve this paper and make it clearer and the experiments more comprehensive. In the following we give detailed answers and explanations to the issues raised.

Comment: P2164, 2.1 Setup of the humidified nephelometer I did not find any explanation about RH2&T2 and the tube between the humidifier and the dryer. Then in Fig A1 there is a time series of RH and T and the temperature drops very clearly, close to T1. Is there some cooling element or just a long (how long?) metal tube?

Response: We will mention on page 2165, line 1 that there is a 1 m long metal tube

between the humidifier and the dryer: "After passing through a 1 m metal tube the aerosol passes through a dryer. . ..“

Comment: P2164L21- "We moved the original RH and T sensor in the nephelometer (described by TSI as the sample RH) to the nephelometer inlet" Is this then RH4 & T4 in Fig 1? "However, the temperature measurement by the TSI sensor is necessary for the nephelometer calibration and was therefore kept in the system." Which T number in Fig 1 is this?

Response: We will change the sentence to: "We moved the original RH and T sensor in the nephelometer (described by TSI as the sample RH) to the nephelometer inlet (not shown in Fig. 1).“

Comment: P2167L7- "The residence time of the aerosol at high RH depends on the operating conditions. During hydration the aerosol experiences 3 s at high RH before entering the nephelometer while during dehydration this time is shortened to 1 s." What is the time needed for reaching equilibrium state? Is 1 s enough for all sizes? References.

Response: References see page 2174, line 2. It is expected that for most aerosol types 1 second is enough to reach equilibrium.

Comment: P2176L23- "Even though multiply charged particles are considerably less numerous than the singly charged ones they can significantly contribute to light scattering due to their larger size. The percentage of doubly and triply charged particles in terms of numbers ranged from 9.5 to 24%, and from 1.5 to 6%, respectively." This is a question that I hope the authors would discuss more. After all, SC = SUM(N(Dp,i)*Q(Dp,i)*A(Dp,i)) where now Dp,i would be the size of particles with i charges. Both Q and A are so much larger for the doubly and triply charged particles than for the singly charged ones that their contribution may really be significant. Please present numbers, what is the contribution of doubly and triply charged particles to scattering?

Response: For the 100 nm particles with 24% doubly charged particles and 6% triply charged particles the singly charged particles are only contributing about 10% of the total scattering and the triply charged particles contribute about 20% of the total scattering. For the 300 nm particles with 9.5% doubly charged particles and 1.5% triply charged particles the respective numbers are 30% and 30%. This information is now also given in the new manuscript.

Comment: Did you actually calculate the scattering as the sum SC = SUM(N(Dp,i)*Q(Dp,i)*A(Dp,i)) over all charging states in the modeling? If not, that might explain some of the fairly large difference between modeled and measured SC/N in Figs A2 & A3.

Response: Yes, we calculated the scattering as the sum over all charging states (singly, doubly and triply) in the modeling.

Comment: Figures 4 and A5. I would rather see these on top of each other. And the whole discussion related to A5 could easily be in the main text instead of in the appendix. But that is a matter of taste.

Response: We prefer to keep the figures and the text as they are.

Interactive comment on Atmos. Meas. Tech. Discuss., 2, 2161, 2009.