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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Water content of aged aerosol" *by* G. J. Engelhart et al.

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We have read and discussed with pleasure your manuscript within our group (aerosol physics group, Laboratory of Atmospheric Chemistry, Paul Scherrer Institut) literature seminar and we came up with the following comments and questions. We hope, that our comments will help the authors to improve the manuscript.

Page 21655, line 19-20:" One of the major limitations of the H-TDMA comes from most measurements occurring at 90% RH,. . ."

Measurements at constant, for example 90% RH have the advantage that they are easy comparable. It is not an instrumental limitation, more a question of the aim and research question one has. Most HTDMAs have the ability to measure diameter growth factors at a wide range of RH.

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Interactive Discussion

Discussion Paper

Page 21656, line 9-10: “Despite the many contributions of H-TDMA measurements, this technique lacks the ability to measure liquid water content of atmospheric particles in their ambient state.”

The HTDMA is able to measure the liquid water content of atmospheric particles in their ambient state, even if it is more complicated: measuring humidograms (scanning through an RH range) at sufficiently numerous dry sizes, and with having a separate ambient RH measurement.

Page 21656, line 29 to page 21657 line 2: “Its major advantage is that it measures the aerosol water concentration of the full PM0.5, PM1 or PM10 distribution and does not focus on the behavior of particles of a given size like the H-TDMA.”

We would not say, that it is a major advantage, if the measured sizes represent relevant diameter of the size distribution, it is simply a different technique.

Page 21658, line 2: please give the exact start and end dates of the campaign

Section 2.2.1: Have you performed any calibration of the instrument with test aerosol? For instance dry and humid ammonium sulphate measurements would be helpful to see the characteristics of the instrument.

Page 21659, line 22 to Page 21660, line 14 Here, the correction of the integration boundaries is introduced. It is argued that the lower integration limit does not have to be corrected since first, only a small fraction of the particles are present below 15 nm and second, the small particles do not contribute significantly to the total volume. Please be more specific at the first point. How small is this fraction (average, min, max or other statistics like percentiles)? The determination of the upper integration limit is also only correct if this fraction of the small particles is always negligible, since the upper integration limit is searched where the dry total integrated concentration equals the wet one. If there is a significant error in number which is introduced by the not corrected lower integration limit this will introduce an error for the upper integration limit

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as well. Losses in the drier would case the same kind of problem in the determination of the upper integration limit. Do you have any information on the losses? Please comment on these.

Page 21660, line 15-18: "If we assume that the aged submicrometer particle population was homogeneous and therefore all the particles have the same growth factor then"

What do you mean by the aerosol population being homogenous? Please specify it! Is it that all particles have the same chemical composition? In that case the above statement is not correct. What about the Kelvin effect? Smaller particles grow less. With this equation 4 is also not valid. This effect might be small at 70% RH, but still it has to be discussed.

Page 21663, line 10-14: "The particles during FAME-08 showed no signs of efflorescence (Fig. 4.). The particles retained as much as 10% of their total particulate volume in water at 20% RH."

This is a very interesting finding. Marine air-masses often arrive to the station, where a high fraction of the particles could be sea-salt. How is it possible that no efflorescence behavior can be observed? Is it not possible that you simply "miss" this behavior by measuring only always at ambient RH? Probably when marine air-masses arrive to the station they are humid as well, so you are however above the efflorescence point, and with this you measure always a VGF>1? To find this out we would suggest coloring figure 4 according to the air-masses. Also because in this plot you show a mixture of different aerosol types, and these might show quite different growth behavior.

Page 21664, line 4-5: please give the value of the correlation coefficient.

Section 3.4: The DAAS and the AMS measured water content was compared to theoretical calculations. Using the theory why don't you try to correct the AMS measured water content to the ambient RH and compare then the two measurements as well?

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 21653, 2010.