Atmos. Chem. Phys. Discuss., 6, S6575–S6578, 2007
www.atmos-chem-phys-discuss.net/6/S6575/2007/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Closure between measured and modelled particle hygroscopic growth during TORCH2 implies ammonium nitrate artefact in the HTDMA measurements" *by* M. Gysel et al.

Anonymous Referee #2

Received and published: 26 January 2007

Review of "Closure between measured and modelled particle hygroscopic growth during TORCH2 implies ammonium nitrate artefact in the HTDMA measurements," Gysel et al.

General comments:

The central theme of this manuscript is that ammonium nitrate is volatilized in an HTDMA and thus does not contribute to measured growth curves.

The paper is overly long and convoluted, with a cursory discussion of many topics, but

not very well referenced in that the seminal papers are not referred to, but rather some later work is cited. It could be shortened considerably and the figures condensed to only present central ideas or themes. Some of the figures are so small for the amount of information presented that it hard to see how they are all that useful in their present form–in Fig. 3, for instance, the distributions of dC/dGF are not very useful. Maybe a mean and standard deviation of the distribution would present better.

However, after all the discussion, the central theme of the paper, loss of ammonium nitrate in the HTDMA, could be verified or measured in a few hours in the laboratory. Why not just do a lab experiment and be done with it? Then make some recommendations as to how to use and interpret HTDMA data.

Specific comments:

Page 12505, line7: Hand et al. (2002) is hardly the definitive reference for perceived visibility impairment as a result of atmospheric aerosol concentrations. Same comment for many of the other references in the introduction.

Page 12506, line 2: "it has been found that the organic aerosol fraction does most likely contribute to hygroscopic growth." Your reference paper by Carrico et al. (2005) suggests otherwise, and papers by Malm et al. (2003, 2005) show that ambient organics are only weakly hygroscopic at best.

Page 12510, discussion surrounding equation 1: Eq. (1) is only used to extrapolate the measured growth curves to 90%, and in most cases this apparently is only a few percent. Why not just present the data at the measured RH and model to the measured RH? That wouldn't change the conclusions of the paper or the ensuing discussion and would alleviate much of the superfluous discussion on this page.

Page 12512: The English here is somewhat difficult. The whole paper could use a technical editor. Again, the discussion on this page doesn't seem to be central to the paper. It reviews an equations and discussions that can be found in other papers.

ACPD

6, S6575–S6578, 2007

Page 12513, line 3: The statement, “Volume additivity in the dry mixture is again assumed. Since only mass fractions and not absolute masses are needed in Eq (4), the applicationĚ” This statement is true if all species in the AMS are collected with the same efficiency. Is this true? Are all ions, whether they are internally or externally mixed or mixed with various OC molecules, collected with the same efficiency? It would have been nice to have independent, conventional measures of inorganics and OC that validate much of what has been assumed.

Page 12515, lines 1-3: The statement, “were not completely internally mixed,” seems to assume only one kind of internal mixture. It could be that all particles are internally mixed but with different mixing ratios of relevant molecules. I don’t see the need to present the four hydration-dehydration curves. They add little to the overall premise of the manuscript, and significant conclusions are not drawn from these curves.

Page 12517, line19: The whole discussion is about AMS collection efficiency, and it is stated that, in the presence of high nitrate concentrations, closure is not achieved between DMPS and AMS. If one does not have the same collection efficiency for nitrates versus other particles in the AMS, how can one use AMS data to say anything conclusive about losses of nitrates in the HTDMA? It is assumed that the AMS collection efficiency for all those molecules analyzed is the same. Is there a reference for this assumption; is this assumption really true?

Page 12518: The discussion of trajectories and aerosol types is interesting but again not central to the paper. If one has to rely on air mass origin to validate an instrument measurement, the measurement scheme is in big trouble. Usually, it is the other way around.

Page 12521: If statistics are presented, the authors might want to also present standard errors of regression coefficient and R2.

Page 12523: The use of “much difference” and “I believe” are value judgments. How much difference? And a belief does not have any place in science. Either you show or

ACPD
6, S6575–S6578, 2007

EGU

don’t show a relationship. Belief is for religion.

Page 12524, paragraph starting with line 19: When the AMS/ZSR prediction of growth is compared to the mean growth of only the hygroscopic particles (including nitrate as indicated in Fig. 9), good agreement is achieved for all sizes. One could certainly argue that, because the AMS only sees nonrefractory material, this is the pertinent comparison. It seems that the use of observed nitrate concentrations work well under this assumption, implying that nitrates may not be lost in the HTDMA–or am I missing something?

Pages 12525 and 12526: Lots of “beliefs” here!

The paper should be published but shortened considerably, possibly as a technical note as suggested by another referee.

Technical corrections:

“Artifact” and “modeled” are misspelled in the title and other words are misspelled throughout the text.

References: Malm, W. C., Day, D. E., Kreidenweis, S. M., Collett, J. L., and Lee, T. 2003. Humidity Dependent Optical Properties of Fine Particles during the Big Bend Regional Aerosol and Visibility Observational Study(BRAVO). Journal of Geophysical Research-Atmospheres, 108, art. no. 4279.

Malm, W. C., Day, D. E., Kreidenweis, S., Collett Jr., J. L., Carrico, C. M., McMeeking, G. R., Lee, T., Carrillo, J., and Schichtel, B. A. 2005. Hygroscopic properties of an organic-laden aerosol. Atmospheric Environment, 39, 4969-4982.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 12503, 2006.