

Interactive comment on “Consistency between parameterisations of aerosol hygroscopicity and CCN activity during the RHaMBLe Discovery cruise” by N. Good et al.

Anonymous Referee #2

Received and published: 23 December 2009

General:

The paper deals with the investigation of the hygroscopic growth and activation behavior of aerosol particles during the RHaMBLe Discovery Cruise D319 in the Tropical Atlantic. The investigation comprise measurements of hygroscopic growth with an HTDMA, and critical supersaturations needed for activation utilizing CCN. These measurements are accompanied by chemical characterization by means of an AMS and a multistage impactor. Besides comprehensively characterizing the aerosol, the study aims at testing a single parameter model with respect to it's ability to describe water uptake under sub- and supersaturated conditions.

C8905

According to my opinion, the scientific methods are sound and results are original. The paper is nicely structured but lacks clarity in how results are presented (see below). Throughout the whole paper the phrasing is somewhat unprecise.

The investigations address a topic highly relevant to atmospheric research and could be accepted for publication after significant revisions.

Specific:

page 22660, abstract: The abstract is a little vague and needs to be more specific in summarizing the main results of the paper.

page 22663, eq. 1 and 2: I suggest to move the 'description' of the Koehler theory to section 2. The Koehler equation could be given and the different approaches and assumptions used/made could be introduced.

page 22663, line 16 ff: I think I have an idea what the authors are trying to say here. However some rewording could be useful.

page 22664, line 4: The expression 'large aerosol populations' seems a little vague.

page 22664, line 19ff: Giving this reasoning at the end of the introduction is somewhat unusual. Authors might think of moving it upfront.

page 22666, line 9: performed -> measured

page 22666, section 2.3: I suggest to restructure this section in the following way:
- introduce CCNC - describe the CCNC's calibration - explain how it was used, i.e. subsequent to the DMPS ...

page 22667, line 14: I don't see how a temperature gradient could deem a supersaturation. Rewording necessary.

page 22667, line 25ff: Shouldn't it be the other way round (sulphate rich vs. sulphate poor regions)?

C8906

page 22668, lines 8/9 and 9/10: "... component compounds" -> sounds wrong.

page 22668, lines 12 - 16: I guess this means that the same growth factor was assumed for different dry particle sizes and the corresponding moles of organic solute were then determined assuming the surface tension of water ? More explanation is required here. Part of the explanation could already been given when introducing the Koehler equation and referenced here.

page 22668, lines 22: the composton -> the composition measured by AMS

page 22669, lines 6 and 7: The statement is a little vague. And to my understanding this statement is not necessarily true. It should be explained briefly under which assumptions kappa varies with size and RH and why (non-ideality, slightly soluble substances (change in surface tension?))

page 22670, lines 1 and 2: This is confusing. Why not integrate the number size distribution from Dthres to infinity ?

page 22670, section 3: This section needs to be streamlined and Fig. 2 should be explained properly and in more detail. This should include a description of what is shown (e.g. 'totals ?) and a thorough discussion of the differences of the AMS and impactor measurments. I consider this a key figure in understanding the results presented later. It should be explained in more detail how the DMPS determined volume is used here.

page 22671, section 3.1: I think a figure would be nice here. Maybe a frequence distribution of growth factors would be useful.

page 22672, section 3.2: It should be stated more clearly that figure 3 represents a comparison of measured (HTDMA) and AMS+modelling derived growth factors and kappas.

page 22672, line 20 and page 22673, line 7 (and similar also for Period 3 on page 22673): How can DMPS derived volume and AMS measured total mass be compared ? Rewording required.

C8907

page 22672, line 25 and 26: How can values be in agreement but have no strong correlation? Rewording required.

page 22673, line 25: Why is chi2 only given here? I suggest you give the respective values for all periods.

page 22674, line 10: I suggest to also include 'error bars' indicating the variability in fig. 5.

page 22674, line 18: I wonder where the multiple charges went! Some of sizes investigated are located left of the size distributions maximum, i.e., the measurement should be affected by multiple charges. The authors should at least comment on that and/or give an estimate.

page 22676, line 6ff: This far too vague. As this might be an important result of this paper more discussion is needed.

page 22676, section 3.3 Here the authors should be more explicit. As this is a quite important section, they should clearly explain and discuss their reasoning and methods. In my opinion a reference is not enough. Figure 7 is somewhat unclear.

page 22677, line 4: "... remains constant as the RH ..." -> "... remains constant at the RH ..." ->

page 22677, line 16: These surface tensions seem a little low for such a 'simple' aerosol. Authors should discuss the derived values and or the uncertainties of the method used to derive them. I personally consider this an artefact, but maybe I'm wrong !?

page 22686, figure 1: I suggest to introduce 'error bars' to indicate the variability.

page 22688, figure 3: This figure is far too small. Furthermore - a,b, c should replace by period 1, 2, 3 - x and y axis lables should be consistent - GFs should be given in the upper and kappas in the lowere panels - text, caption, and lables should be consistent

C8908

- proper and consistent presentation of average kappas

page 22690, figure 5: The lower panles of this figure are too small. Furthermore, I suggest to switch upper and lower panels, and indicate variabilities.

page 22691, figure 6: This figure is far too small !

page 22692, figure 7: Personally I'm not able to deduce anything from this figure. I highly recommend to make the readers' life a lot easier here.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 22659, 2009.