

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

Anonymous Referee #1

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In the present manuscript a single parameter approach to describe CCN activity (κ -Köhler theory) is tested in the marine conditions. The main idea has been to use AMS, HTDMA and CCN counter to study the ability of κ -Köhler theory to describe CCN activity of aerosol particles. It is shown in the manuscript that the CCN activity estimated from HTDMA growth factors might be too small in some cases. This result is important for the aerosol research community as κ -Köhler theory is used in many models to predict water uptake and CCN activity of aerosol particles. I have only few comments on the manuscript, mainly minor, and after addressing those I recommend the manuscript to be published.

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My main concern is related to κ values. End of section 2.6 is not too well written, or at least I could not easily understand how different κ values are actually derived. Also more discussion on the size dependence needs to be added, especially why it is going to different directions for different devices. I have difficulties to understand why differences are so large. How does the values compare to those from other studies, or pure substance theoretical values? Did you also include organics when you derived κ values? As far as I can see κ values do not agree within 0.2, and such a difference is notable.

Minor comments

Abstract: It is stated that “The water activity appears satisfactorily represented by a single parameter derived at 90% relative humidity (RH) for RHs less than 94%.” This sounds like it does not work above that, but you do not really know if it is wrong or correct between 94% and 100%.

Page 22662, line 5: The position of “e.g.”

Page 22667, lines 25-29: It is stated that in sulphate poor regimes there is excess number of moles of SO₄²⁻. Should it be opposite?

Page 22668: You say that GF for organics is estimated to be 1.2. Does it change results if some other value is used?

Section 3: It would be useful to have a map of cruise area including the main origins of air masses.

Page 22671, line 28: Should it be “with a varying influence from organics”?

Page 22673, line 21-22.: Here you give the total mass during period 3. For period 1 the mass was given in page 22670, but I can not find it at all for period 2. Is it actually relevant at all to know what is the mass as the only important thing is how big fraction is seen by AMS?

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Page 22673: You talk about κ values between 1.15 to 1.40. How do you explain those? In Table 1 the single component values are below that.

Page 22677: line 15: Are such surface tensions reasonable based on the existing knowledge?

Citations: Allan et al. 2009 is already in ACP.

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