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Interactive comment on "A curved multi-component aerosol hygroscopicity model framework: 2 – Including organics" *by* D. O. Topping et al.

D. O. Topping et al.

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Thank you again for your general comments and support of the work which has been presented in the paper. The remarks made are addressed below.

Specific comments

Introduction, paragraph1 .'The authors should also mention the work by Miklhailov et al (2004) where HTDMA experiments and different approaches to modelling of mixed aerosol composed of the inorganic salts and water soluble protein are presented.' Response - The end of the first paragraph now includes - 'Extending the limited analysis of macromolecular compounds, Mikhailov et al (2004) also studied the behaviour of

the protein bovine serum albumin (BSA), chosen as a representative compound for proteins and other macromolecular organics, and the inorganic salts sodium chloride and ammonium nitrate by laboratory experiments and model calculations.'

P8688, line 8 '"in fig. 3b is the mass ratio parameterisation"' Someone should explain the mass ratio m/mo meaning (Fig 3.b). Note the molality has identical symbol (P8683, Eq(2)).' Response - line now added - 'The mass ratio M/Mo represents the solute plus water mass over the original dry solute mass.' The figure has been updated accordingly replacing the symbol 'm' with the full explanation - Mass ratio = (Mass solute + Mass water)/ (mass solute).

P8691, lines 6-10. 'Comment on fig 6 ."in all cases, as deviations increase with dcreasing relative humidity, the model tend to underpredict the observed water content associated with the mixture". As seen in figure 6 in three of four cases the model molality positioned lower than the experimental values. It means that model over predict observed water content, and so organic-inorganic interactions lead to negative contributions. It should be corrected.' Response - This short body of text has now been replaced by 'In three of the four cases (figures 6a, 6c and 6d) as deviations increase with decreasing relative humidity, the model tends to over predict the observed water content. In this case it seems as though the organic-inorganic interactions lead to negative contributions to the total water content for NaCl and (NH4)2SO4. Such a conclusion is validated by the ability of UNIFAC to reproduce measured water activity for the mixtures discussed in section (2.1) at low relative humidity. For the mixture with NH4NO3 however, the model seems to under predict the observed water content, thus leading to the notion that the organic-inorganic interactions lead to positive contributions to the total water content in this case.'

P8697, line 12 ''to the choice of A'. Symbol A should explain here.' Response - in line 2, the definition of Ai which was missing has now been added '..,Ai the surface area of component 'I' in cm2 mol -1'.

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P8698, line 25 .'It is desirable to show the values of parameters a and b for succinic and glutaric acid.' Response - The text now reads - 'Where a and b are experimentally determined parameters (Succinic: a=0.0127, b=175.28, Glutaric: a=0.0222, b=189.61 [Gaman et al 2004])'

P8700. 'Discussion of ADDEM predictions. Should explain the growth factor (D/Do) meaning. Because of in figs 9-12 it used without explanation.' Response - P8700 line 1 - following text has been added - 'Any results taken from the HTDMA are usually reported as the growth factor (D/Do) where D is the wet particle diameter and Do the dry particle diameter.'

P8702, lines 8-14. 'The listed values contain excess of significant digits.' Response - the short body of text has been modified to - 'For a 10nm aerosol, the growth factors differ by 0.015 at 90%RH. At this RH both surface tension models differ by 8.33 dyne cm-1, the thermodynamic model at 65.70 dyne cm-1 and Tamura's method at 57.37 dyne cm-1. At a lower RH of 60% the difference in increases to 9.5 dyne cm-1. However, this translates to a difference in growth factor of only 0.003. As the dry size increases to 50 and 100nm, this difference falls to 8.3x10-4 and 4.3x10-4 respectively. For 90%RH again the difference decreases to 5.7x10-4 and 3.1x10-3. Thus, the choice of surface tension model becomes more important at higher RH and lower dry size.'

P8717, Fig 4 .'I did not find in the text any mention concerning this figure.' Response - This should have been referenced in section 2 'thermodynamics'. As such P8638 lines 20-24 have been modified to - 'Whilst possible to include solid precipitation for the organic/water systems by using what little data is available to constrain the model, this is not treated here. Including solid precipitation within the modelling framework cannot be justified as the full range of interactions taking place is not considered (figure 4).'

P8719, P8720. Fig 6. 'The symbols a), b), c), d) are missed in the pictures. In all pictures the x-axe should express in % RH. In two places the cite on marcolli et al. is written as marcolli et al.' Response - the figures have been updated accordingly.

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Figure captions have also been updated to reference Marcolli rather than marcolli.

Technical corrections

P8691, line 6. ‘’1.02894%’ too many digits’ Response - text changed to ‘Minimum deviations as small as 0.35% and 1.03% are found for the same two salts at 77.3% and 74.4% RH respectively.’

P8694, line 20 ‘P should read [P].’ Response - text changed accordingly.

P8699, lines 14-15, ‘The text in brackets should delete’ Response - The text has been changed accordingly

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Interactive comment on Atmos. Chem. Phys. Discuss., 4, 8677, 2004.