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Interactive comment on "A curved multi-component aerosol hygroscopicity model framework: 1 – Inorganics" *by* D. O. Topping et al.

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The authors would like to thank you for your time in reviewing this paper and support of the work which has been presented. The remarks made are addressed below.

Specific comments

P8636 Eq (11). 'Taking into account the dimension of this relation the numerator (Mi) should be the number of moles.' Response - This has been corrected

P8652, line 2 - '7.2 surface tension" should be replaced by 7.1.2 Surface tension, and reduce all the following sections in Chapter 7 in one unit. Correct this shift in the text where it necessary' Response - In the sensitivity section the response of the model to varying energies of formation, surface tension models and density models was kept

separate for clarity. Here the surface tension sensitivity was not considered as a thermodynamic sensitivity, rather an analysis on the different models available in the literature. As such, the section heading '7.1 Thermodynamic parameters' has been removed and replaced the section heading '7.1 energies of formation' to avoid confusion.

P8639 and P8640. 'In Eq (13) and (14) surface tension, solution density, and droplet radius are identical, but have different designations' Response - this has been corrected.

P8651, line 10, 'text is missing' Response - this has been corrected. It should read 'The adjustment in for each solid component results in no need to adjust the values of for the ions or gaseous components.'

P8655, line 13. 'In discussion about the history of the aerosol studied in a HTDMA experiment the authors should also mention the work by Mikhailov et al (2004) where the influence of drying process and chemical decomposition of particles on the theory results are considered in detail.' Response - the following text has been added. 'Mikhailov et al (2004) considered such influences in detail. In their study the authors used the HTDMA to investigate the hygroscopic growth and microstructural rearrangement of aerosols composed of the protein BSA, NaCl and NH4NO3. They found that depending on their origin and conditioning these particles can have complex and highly porous microstructures, which are influenced by electric charge effects and interactions with water vapour (Mikhailov et al 2004).'

P 8664, Table 1. 'too many significant digits in Adj(delta)Gfo. As such, these values obtained based on experimental data, there is no sense to show so many figures. DRH should be expressed in %.' Response - As discussed in section 7.1.1 the predicted deliquescence point of the different solids was found to be particularly sensitive to the choice of Gibbs free energy used. The accuracy with which the values are presented in table 1 are used to reflect this and represent those values which minimise the difference between predicted and observed deliquescence points. The DRH values in table 1

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have been changed to a % scale accordingly.

P 8666, table 3. ‘Again, it is not necessary to show so many digits to retrace deviation between GFZSR and GThermodynamic. I recommend to reduce subscript “thermodynamic”, the same also in P8647, line 21’ Response - the numbers presented in table 3 have been reduced to 3 decimal places. The subscript ‘thermodynamic’ has been replaced by ‘thermo’ both in the table caption and also in the text.

P8667, Table 4 ‘obtained results based on 3 density combination rules. As such they are not discussed in the text the corresponding references should be shown. Growth factor standard deviations may be reduced at least in one order.’ Response - the table caption has been changed to -‘ Growth factor standard deviations for 3 different systems using 3 different schemes for defining the aqueous composition (described in section 7.3.2) from a knowledge of the ions present, for use in the simple density mixing rule defined in section 4.2. Here the mass fraction of dry solute has been used in the simple formulation presented in section 4.2. All calculations were made at 25oC’. The accuracy of the standard deviations has been kept simply to show the slight variation present.

P8669, Fig 2 ‘Tang et al (1981) this reference is missing from the list of references’ Response - This reference has been added to the bibliography.

P8670, Fig 3. ‘what is the unit on the y-axe? RH should express in %’ Response - Figure has been updated accordingly.

P8672, Fig 5. ‘the references Tang et al (1986) and Hameri et al (2002) are absent in the list of references’ Response - these references have been added to the bibliography.

P8673, Fig 6. ‘the x-axe has no title’ Response - Figure has been updated accordingly

P 8675, fig 8 ‘the symbols a), b), c) and d) are not shown in the pictures. The graphs c) and d) are plotted using 3 solution density models. What are they? (see comment

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to table 4). Due to part of the iullustrative material (table 4, fig 8) based on 3 density models I would suggest briefly to treat them all in the text.' Response - This is clarified in the revised text. For figure 8a and 8b, two (rather than three) different surface tension models, described in the text, were used to calculate two different growth factors. Table 4 actually represents a different analysis to that presented in figure 8. In table 4 one solution density mixing scheme is used whilst the determination of solutes present, from a knowledge of the ions in solution, is derived from 3 different methods.

P8676, fig 9 'Again, symbols a), b) are not shown in the pictures. The reference on the Perry's Chemical handbook should be complete and indicated in the list of references' Response - figure 9 has been corrected accordingly and the bibliography updated.

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 8627, 2004.