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

Anonymous Referee #3

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General comments: The paper under review presents a new thermodynamic equilibrium model for mixed inorganic salts. While in recent years numerous inorganic thermodynamic models have been published, this model presents a new approach with clear advantages: It is based on the direct minimization of the Gibbs free energy and includes furthermore the flexibility to use a combination of mixing rules to calculate the water content and the ability to treat the Kelvin effect. Moreover it is designed to be extended to accommodate organic substances. The authors address the sensitivities of the new model with sensitivity studies and compare the results with data from another diameter dependent thermodynamic model. In short, this manuscript represents a new and original contribution, which I recommend for publication after the authors

have addressed the following remarks.

Specific comments: Given the described advantages of the new model, it could be considered to be implemented in a chemistry transport model. The authors should comment on what computational resources are needed for running the model. Would it be feasible to implement it in, say, a box model, 1D model or 3D model? For the same purpose the authors should state clearly in the abstract and summary for which range of temperature and RH the model will give reliable results. Will it for instance be applicable for the upper troposphere as well as for the lower troposphere?

P. 8639/8640: In Eqns. (13) and (14) the Kelvin term is the same in both but different symbols are used for the variables. They should be the same.

P. 8645, l. 13: It should be 'Eq.(13)' instead of 'Eq.(8)'.

P. 8647, l. 21: I suggest to abbreviate GF_thermodynamic to GF_th.

P. 8651, l. 10: some text is lost in this line.

P. 8652: Figure 8 shows standard deviations. From the text it is not clear to me how these standard deviations are calculated. Please clarify. Also the labels (a), (b), (c), (d) are missing in this figure.

Table 1: I suggest to reduce the number of digits in column "Adj. deltaG_f". Figure 3: The units of the x-axis label are missing. Figure 6: The x-axis label is missing. Figure 9: The label (a) and (b) are missing. In the bottom figure the y-axis label is missing.

Missing references: Hameri (2002), Tang (1981), Tang(1986), Wagman et al. (1982).

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