

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

**Anonymous Referee #2**

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This paper presents a size-dependent thermodynamic aerosol modeling framework. While the general approach of finding the equilibrium solution by minimizing Gibbs free energy is similar to that of GFEMN and AIM, the authors have included Kelvin effect in the calculation for particles smaller than 100 nm. The present paper is focused on the treatment of inorganic components.

The paper is recommended for publication after the following concerns are addressed.

Page 8633, line 14. Typo in charge on Na. Change Na<sub>2</sub><sup>+</sup> to Na<sup>+</sup>

Page 8637, line 20. Shouldn't this equation be:  $a_w = f_w * x_w$  (i.e., mole fraction of

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water seems to be missing)?

Page 8638, line 10. The authors need to refer to the more recent paper by Wexler and Clegg, JGR, NO. D14, 4207, 10.1029/2001JD000451, 2002, for work done on the importance of double salts in ambient atmosphere.

Page 8647, line 11. The distinction between the ZSR and thermodynamic models is not clearly explained. I understand the difference, but it needs to be explained a bit more clearly.

Having said that, I don't understand what the authors are trying to say with Figure 4. The legend and caption of this figure is not clear at all. Which model is used to predict the 8, 20, and 100 nm lines. And why do the ZSR and ADDEM lines not agree with the 8, 20, and 100 nm lines in the super-saturated region? What size particles do ZSR and ADDEM lines correspond to?

Secondly, what dry size particles were assumed for mixtures listed in Table 3? Also, it is stated that the bold values represent growth factor differences. Differences between what? Finally, do these calculations include full gas-liquid-solid equilibrium or only solid-liquid equilibrium?

On page 8648, line 18, it is stated that surface tension effects were neglected in the discussion above. This is confusing, because Figure 4 shows results for particles of sizes 8 and 20 nm. Please clarify.

Page 8649, line 26. Change "humiditys" to "humidities"

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