The authors presented a comprehensive study of the hygroscopic properties of calcium- and magnesium- containing salts using a vapor sorption analyzer and a HTDMA. The change of sample mass with RH and the corresponding DRH value was reported for these eight compounds together with their hygroscopic growth factor values at 90% RH. The dataset is rich, however, the comparison and discussion is not sound that major revisions are needed. The manuscript may be acceptable for publication in ACP after the following concerns are fully addressed.

Major comments:

1. This work used a vapor sorption analyzer to measure the change of sample mass with relative humidity and the deliquescence relative humidity of eight different compounds. However, as I understand, the materials the author used in this study are not atmospheric particles, but actually bulk samples. Please clarify how these results represent atmospheric conditions. The hygroscopic properties and DRH of aerosol particles would probably deviate significantly from that of bulk samples. Please extend your manuscript with explicit discussions regarding these issues to prove the significance for atmospheric research.

2. What is the relation between the mass growth factor and mobility growth factor as measured by two independent methods? Extensive works have been performed to measure the hygroscopic growth factor of atmospheric relevant compounds from previous studies. How to compare the mass growth factor obtained by the vapor sorption analyzer with their results and what kind of uncertainties should be taken into account?

3. The DRH values of these studied compounds can also be measured by your HTDMA setup. Why the results obtained by your HTDMA did not agree with the ones from the VSP. What is the explanation for the discrepancies? Since the VSP measures the bulk samples, are these results obtained from the VSP measurements applicable in atmospheric research. Could you also please plot the GF-PDF for each compounds measured by the HTDMA? Are there unimode or bimode for your growth factor distributions at different RHs?

4. For the inorganic species you studied, you stated they are important components in mineral dust or sea salt particles. However, for the VSA measurements, you studied their hygroscopic properties of their hydrate forms, while you measured the HGF of these compounds in their anhydrous

state using HTDMA. As I see, the hygroscopic properties of these compounds vary significantly between their anhydrous states and hydrate states (for instance, line 420-421). I feel difficult to relate your results with your introduction and objectives. Which state exist in the real atmosphere? Moreover, which state is hygroscopic and which values should we use for further study? Please clarify and be consistent through your whole manuscript. Otherwise, give your explanations.

5. For your conclusion part, it is more like a summary of your results without any atmospheric implications. Please rephrase it and highlight its atmospheric applications.

Specific comments:

1. Line 93-97: These two statements are in conflict with each other.

2. Line 128-131: How long is your humidifier and what is the flow rate? And what is the accuracy of your RH measurements, please give its uncertainty.

3. Line 139: What do you mean by a particle sample? Did you generate particles and measure the mass of these particles? If not, please rephrase it.

4. Line 210-211: What is the possible reason for the deviations?

5. Line 222-223: Give proper reference for Eq. 1 in your manuscript, the original source but not only these who also cites it. In addition, which solubility (at which temperature condition) you used for your calculation, as it also depends on temperature.

6. Line 225: Enthalpy of what? Deliquensece or dissolution?

7. Line 246: Could you give proper explanation why WSR increase with a decreasing in temperature.

8. Line 253, Table 2: How could you get the WSR value for Ca(NO3)2 at 50% RH, as it did not deliquesce yet according to your previous results in Table 1 (DRH as 60.5%).

9. Line 258-261: I don’t understand the sentences.

10. Line 265: What concentration do you mean here? Bulk solution or droplet? Please be specific.

11. Line 286: Did you also observe similar phenomena for the other two inorganic compounds for phase transition, as it seems to be according to Fig. 1 in your manuscript.

12. Line 311-312: I don't think this is fairly new result as it is still bulk sample. We should always consider size effect as it is atmospheric or at least particle-relevant.

13. Line 337: What is the stuff after atomizing? Are they in hydrate state or not?

14. Line 363-365 and line 379-382: So should we use the dry diameter selected by the DMA (100nm) or not. If yes, it seems your results did not agree with the ones from Gibson et al., (2006) in line 363-365, but agreed in line 379-382. Please clarify.

15. Extra cautions must be taken by introducing several scientific terms in the manuscript. For instance, in line 221-223. What is the scientific reason to study the temperature-dependence of DRH and its enthalpy value? Please clarify. For instance, in line 258-263, why you studied the water-solute ratio and what is this variable used for? What is the relation between water activity and water-solute ratio? And how you converted it to each other in details?

16. Which particle size did you selected during the HTDMA measurements? In Eq. 4 in your manuscript, where is the Kelvin term? Please use the correct formulation and make further comparison. For instance, in line 410-411, which particle size or which supersaturation they selected in their CCN measurements?

17. In addition, please rephrase your discussion part and make sound comparisons with the other studies. For instance, line 367-368, GF of $Ca(NO3)2$ aerosols was measured to be 1.79 in your work, while Jing et al., (2018) reported it to be 1.89 at 90%RH. In line 387-389, Park et al., (2009) measured the GF of $CaCl2$ to be 1.59 at 90% RH and the measured value from your result was 1.71. There were some differences (around 7%) but not always in good agreement as you stated in the manuscript between your results and the ones from others. Please give proper discussions.