Comments by Referees are in blue. Our replies are in black. Changes to the manuscript are highlighted in red both in here and in the revised manuscript.

Reply to Ref #1

Water adsorption and hygroscopicity are among the most important physicochemical properties of aerosol particles. The authors developed a novel method to provide the information on mass hygroscopic growth of atmospheric particles. It can be considered to be published in AMT after modifications.

Author reply: We would like to thank Ref #1 for his/her highly positive comments on our manuscript. All the comments have been properly addressed in our revised manuscript, as detailed below.

(1) There is no information on how to collect the samples on the pan. The effects of the weight and thickness of dry sample on the results should be discussed.

Author reply: In the revised manuscript **(line 136-140)** we have included a few sentences to explain how particle samples are prepared and to discuss the effects of sample mass: "Powdered particles are transferred into the sample pan using a small stainless-steel spatula. The mass of the sample would not affect the measured mass ratio of dry particles to associated water under a given condition; however, it would take more time to reach the equilibrium if the sample mass is larger."

(2) Page 8, 169: determine the DRH. In this section, the authors mentioned that the method was developed based on the ASTM, 2007, but, lack of the detail description on the principles. The authors should descript why the DRH can be determined by following step 1)-3) (Line 176-179). Typically, the efflorescence RH was detected by measuring the change in hygroscopic growth with decreasing RH. Why, DRH was detected by this method?

Author reply: We agree with the referee that the principle of this experimental method is not very clear. After we submitted this manuscript, we have adopted a second method to measure DRH. The second method measures the mass change when RH is stepwise increased with an increment of 1% per step. The second method is preferred (and will also be always used in future) because the occurrence of deliquescence can be detected at the first RH when a significant increase in sample mass is observed. In the revised manuscript **(line 215-232)**, we have added one paragraph and a new figure to describe this experimental method. Please refer to our revised manuscript for further details.

(3) Page 8, 178-179: RH is set to a value which is ~5% (when change/difference in RH is mentioned in this work, it always means the absolute value) higher than the anticipated DRH. Here, "higher" or "lower"?

(4) Page 9 180-181: 3) RH is linearly decreased with a rate of 0.2% per min to a value which is ~5% lower than the anticipated DRH. What does mean here?

(5) Page 8 178-Page 9 181: The description is different from what were done in Figure 2.

Author reply: The three comments above are all related to one experimental method, and they are addressed together. In the revised manuscript **(line 191-195)** we have rephrased several sentences in this paragraph to make our experimental procedure more clear: "After the sample pan is properly located in the humidity chamber, temperature is set to the given value. After temperature is stabilized, RH is set to a value which is ~5% (when change/difference in RH is mentioned in this work, it always means the absolute value) higher than the anticipated DRH and the system is equilibrated for 120 min. For example, the DRH of NaBr is expected to be around (57-58)%, and RH was set to 62% from 0 to 120 min, as shown in Figure 2a. In the last step, RH is linearly decreased with a rate of 0.2% per min to a value which is ~5% lower than the anticipated DRH.

For example, as shown in Figure 2a, RH was decreased from 62% at 120 min to 54% at 160 min, and the RH decrease rate was 0.2% per min."

(6) In Figure 4: Too few data points are given. Only one data point showed the particle growth factor. It is difficult to judge the agreement is good or not.

Author reply: We agree with the referee. We have conducted additional measurements with RH increment was reduced from 30% to 10%, and the new results have been presented. In our revised manuscript **(line 326-345)** we have also expanded our discussion on comparison of our measurement with E-AIM predictions.

(7) If the slow response of vapor sorption analyzer (hours for each measurement) is a drawback for the future applications?

Author reply: We agree with the referee. In the revised manuscript **(line 398-404)** we have discussed the drawbacks of this technique: "We note that this technique also has a few drawbacks: 1) this technique cannot be used to examine supersaturated droplets or determine efflorescence relative humidities (ERH), due to the contact of particles with the sample pan; 2) substantial amount of particles, typically around or larger than 1 mg, are required by this technique, limiting its application to atmospheric particles even after they are collected (e.g., using a filter or an impactor plate); 3) the experiment is very time-consuming, and a typical experiment can take several hours and even a few days, depending on experimental conditions."