

## ***Interactive comment on “Effect of the exclusion of crustal ions (Ca<sup>2+</sup>, Mg<sup>2+</sup>, and K<sup>+</sup>) in estimating water content of PM<sub>2.5</sub> at polluted and clean areas” by Hyung-Min Lee and Yong Pyo Kim***

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Thank you for the review. In this reply, we have discussed major issues and detailed item-by-item response will be given later with the revised manuscript.

1. No water content measurement during same time periods and location that can be used to validate the model's results:

There have been a few researches to develop and apply aerosol water content measurement instruments. Still, it is hard to measure aerosol water content and chemical composition simultaneously, especially, for PM<sub>2.5</sub> (McMurry, 2000). For example, a Tandem Differential Mobility Analyzer (TDMA) has been used to measure aerosol wa-

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ter content both in the field and laboratory measurements (Chan and Chan, 2005). However, TDMA measurement has been limited to sub-micron size particles. In addition, these data are rather short-term measurements.

A major goal of this research is to estimate the new chemical equilibrium state between the gas and aerosol phase including aerosol water content if crustal species are removed in the system. There are several cases that can cause this kind of situation. One notable example is the improvement of living standard in Northeastern Asian countries. To accomplish the research goal, we have collected and compiled various measurement data sets. However, there are few data sets that satisfy our requirements; (1) a sizable fraction of particles being crustal species, (2) long-term data (at least one year) to see seasonal variation, (3) both gas and particle phase data to run an gas/particle equilibrium model, and (4) data from multiple locations (at least two), preferably from polluted and clean sites, to understand the general characteristics of the region. Thus, the data set we could use was limited.

2. More detailed description on the used measurement data: Since we have used published data we did not spend much space for describing the data sets. However the authors agree with the reviewer that evaluation of data set is important and should not have been skipped. We will provide more information in the revised manuscript such as quality assurance/quality control (QA/QC).

3. Compile available water content measurements and compare them with authors' results: Again, the authors thank for pointing out it. We will compile available water content measurements and compare them with our results.

4. More detailed discussion on the phase shift and hygroscopicity variation: We will discuss more about this part and strengthen the analyses.

5. Need of language editing and checking: The manuscript has been checked by a native English speaker before submission. Still, following the reviewer's suggestion, we will have the manuscript checked again.

## References

Chan, M. N., and Chan, C. K.: Mass transfer effects in hygroscopic measurements of aerosol particles, *Atmos. Chem. Phys.*, 5, 2703-2712, 2005.

McMurry, P. H.: A review of atmospheric aerosol measurements, *Atmos. Environ.*, 34, 1959-1999, 2000.

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