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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aerosol hygroscopicity derived from size-segregated chemical composition and its parameterization in the North China Plain" *by* H. J. Liu et al.

Anonymous Referee #2

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The paper "Aerosol hygroscopicity derived from size-segregated chemical composition and its parametrization in the North China Plain" by Liu et al present comprehensive study of k-parameter describing aerosol hygroscopic properties ink-Köhler theory. The paper is well structured and written in a condense manner. Maybe too condense and instead of describing what has been done and interpreting the results, authors just refer to earlier papers. It does not bring any novelty with respect to understanding the aerosol hygroscopic and cloud forming potential, but its value is in good quality analysis of size-segregated aerosol chemical composition and comprehensive and robust analysis of calculated k-values in combination with observed hygroscopic properties

using HH-TDMA. It lacks on the interpretation, analysis of temporal variability and links to meteorology and variability in sources and air mass transport. This part can be certainly improved.

More detail comments:

All values given are average values for whole campaign, but analysis of temporal variability through the campaign and how it is controlled by meteorology and air mass origin (source influence) is missing. Besides deriving one general value for summer conditions, data can be certainly explored more. The range of bars in Fig.4 show great deal of variability. To what degree this is driven by uncertainty in chemical analysis and k-value calculations and by changing aerosol properties and air mass origin? Are high k-values in most abundant mode around 400 nm corresponding to high k-values for sub-100 nm particles or not? How the intermodal variability of k-values reflect changes in meteorology, aerosol sources and aerosol ageing?

On page 20901, L 1-11 authors present brief explanation of the observed average diurnal cycle. What about if the aged aerosol aloft transported into a growing mixed layer is more hygroscopic. It has its origin likely in previous day mixed layer and thus aged for at least a day longer than freshly emitted aerosol. On one hand photochemistry enhanced availability of condensing vapors, on the other hand the diurnal temperature cycle will likely change nitrate partitioning between aerosol and gas phase. I believe that presenting more thorough discussion on diurnal variability of aerosol composition will make the paper better.

The paper deserves publication in ACP. In addition to robust k-values calculation, additional effort on interpretation of the results with respect to other environmental parameters will increase the quality of the paper.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 20885, 2013.