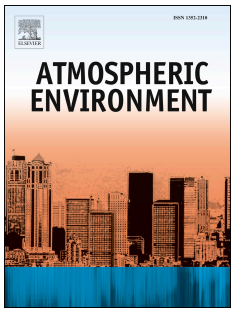
Accepted Manuscript



Statistical analysis and parameterization of the hygroscopic growth of the sub-micrometer urban background aerosol in Beijing

Yu Wang, Zhijun Wu, Nan Ma, Yusheng Wu, Limin Zeng, Chunsheng Zhao, Alfred Wiedensohler

PII: S1352-2310(17)30827-0

DOI: 10.1016/j.atmosenv.2017.12.003

Reference: AEA 15722

To appear in: *Atmospheric Environment*

Received Date: 16 August 2017

Revised Date: 2 December 2017

Accepted Date: 5 December 2017

Please cite this article as: Wang, Y., Wu, Z., Ma, N., Wu, Y., Zeng, L., Zhao, C., Wiedensohler, A., Statistical analysis and parameterization of the hygroscopic growth of the sub-micrometer urban background aerosol in Beijing, *Atmospheric Environment* (2018), doi: 10.1016/j.atmosenv.2017.12.003.

Statistical Analysis and Parameterization of the Hygroscopic Growth of the Sub-micrometer Urban Background Aerosol in Beijing

Yu Wang[1,a], Zhijun Wu[1*], Nan Ma[3, 4], Yusheng Wu[1], Limin Zeng[1], Chunsheng Zhao[2], Alfred Wiedensohler[3]

[1]State Key Joint Laboratory of Environmental Simulation and Pollution Control, College of Environmental Sciences and Engineering, Peking University, Beijing 100871, China

[2]Department of Atmospheric and Oceanic Sciences, School of Physics, Peking University, Beijing 100871, China

[3]Leibniz Institute for Tropospheric Research, Leipzig 04318, Germany

[4]Institute for Environmental and Climate Research, Jinan University, Guangzhou 511443 China

[a]Now at: Centre for Atmospheric Sciences, School of Earth, Atmospheric and Environmental Sciences, University of Manchester, Manchester M13 9PL, UK

Corresponding to: Zhijun Wu (zhijunwu@pku.edu.cn)

Abstract

The take-up of water of aerosol particles plays an important role in heavy haze formation over North China Plain, since it is related with particle mass concentration, visibility degradation, and particle chemistry. In the present study, we investigated the size-resolved hygroscopic growth factor (*HGF*) of sub-micrometer aerosol particles (smaller than 350 nm) on a basis of 9-month Hygroscopicity-Tandem Differential Mobility Analyzer measurement in the urban background atmosphere of Beijing. The mean hygroscopicity parameter (κ) values derived from averaging over the entire sampling period for particles of 50 nm, 75 nm, 100 nm, 150 nm, 250 nm, and 350 nm in diameters were 0.14±0.07, 0.17±0.05, 0.18±0.06, 0.20±0.07, 0.21±0.09, and 0.23±0.12, respectively, indicating the dominance of organics in the sub-micrometer urban aerosols. In the spring, summer, and autumn, the number fraction of hydrophilic particles increased with increasing particle size, resulting in an increasing trend of overall particle hygroscopicity with enhanced particle size. Differently, the overall mean κ values peaked in the range of 75-150 nm and decreased for particles larger