

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2022-414

Anonymous Referee #1

Referee comment on "Measurement report: Size distributions of urban aerosols down to 1 nm from long-term measurements" by Chenjuan Deng et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-414-RC1>, 2022

REPORT on Deng et al.,
" Measurement report: Size distributions of urban aerosols down to 1 nm from long-term measurements"

This manuscript reports the characteristics of atmospheric aerosol size distributions from ~ 1 nm to $10 \mu\text{m}$ with an emphasis on sub-3nm particles from four-year measurements in urban Beijing. On the basis of cluster analysis, three typical types of number size distributions (i.e., daytime NPF type, daytime non-NPF type, and nighttime type) were identified. Based on the modified Whitby model, the simplification of aerosol size distributions in sub-3 nm sizes, i.e., the power function, was introduced. From the source identification of sub-3nm particles in urban Beijing, except for NPF, vehicle emission is another important source. Besides, the concentrations and diel patterns of H_2SO_4 monomer and dimer were also reported to better explain the formation mechanisms of NPF.

This is a unique dataset for which publication is worthwhile. This manuscript is well structured and written. Hence, I would ask one minor revision and recommend the publication of this article in Atmospheric Chemistry & Physics.

Minor comments:

Compared to lognormal distributions of larger particles, please add more discussion on why the power function was suitable to depict aerosol size distributions in sub-3 nm sizes.

Figure 2, were H_2SO_4 monomer and dimer concentration converted into $\text{dN}/\text{d}\log D_p$ according to their mass diameters?

Figure 3, the label of Y-axis "dNdlogDp" should be "dN/dlogDp". Please check other figures in the manuscript and SI.

Figure 4, for panel C, if available, it would be better to add the diurnal patterns of solar radiation and SO₂. Also, around 5 a.m., the concentration of sulfuric acid started to rise. Did sulfuric acid follow the diel pattern of radiation at around 5 a.m.? If not, please comment on it.