

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2021-912

Anonymous Referee #1

Referee comment on "Measurement report: Hygroscopic growth of ambient fine particles measured at five sites in China" by Lu Chen et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-912-RC2>, 2022

The manuscript (Chen et al., Measurement report: Hygroscopic growth of ambient fine particles measured at five sites of China) report the HTDMA data at major cities in China (Beijing, Shanghai, Guangzhou) as well as that from suburban areas (Xinzhou and Xingtai). The data from these places, especially that from Beijing, Shanghai, and Guangzhou, have already been well documented in literature. However, the data from various places have rarely been well compiled. The manuscript should be useful for researchers who would like to know the spatial distributions of hygroscopicity of aerosol particles in China. The data quality looks acceptably good. I suggest publication of the manuscript after addressing the following comments.

Major comments

I understand that the major purpose of the manuscript is to compile the HTDMA data from five locations. It seems that the authors also have the ACSM data for all the locations. However, only the campaign average ACSM data seem to be compared with the HTDMA. It might have been possible to elucidate the controlling factors of the hygroscopicity in more detail by comparing it with the highly time-resolved ACSM data, although it might not be required for a measurement report.

Specific comments

L154 'the non-refractory chemical compositions in PM_{2.5} were measured simultaneously using a quadrupole aerosol chemical speciation monitor (Q-ACSM) in real time'

I wonder if the authors used a traditional aerodynamic lens or PM_{2.5} aerodynamic lens. It would be ideal to clarify it if chemical compositions were measured as PM_{2.5}.

L170 'This indicates different mixing states of ambient aerosol particles between urban and non-urban regions on account of their contrasting emission sources.'

It would be helpful if the authors could provide more specific ideas on the potential differences in emission. I personally wonder if chemical aging of particles during atmospheric transport from urban areas to suburb regions could influence hygroscopicity.

L191 'At the non-urban sites, however, the hydrophobic modes of GF-PDFs were negligible throughout the whole measured sizes.'

Figure 3 clearly demonstrates that hydrophobic modes exist even at non-urban sites, although the fraction could be smaller than the corresponding values for urban areas. I suggest modifying the statement.

L205 'This could be associated with the nucleation process in the daytime, which was demonstrated that the growth of the newly formed particles is mainly contributed by hydrophilic matters'

Is the hypothesis supported by the SMPS data?