In this manuscript, Zhang et al. investigate the aerosol hygroscopicity based on year-long measurement in an urban environment. Measurement data presented is sufficient for a measurement report, however, in its current state I cannot recommend the manuscript for publication.

[1] The authors consider all particles smaller than 100 nm as nucleation mode particles. 40 nm and 80 nm particles cannot be called newly formed particles. These were either emitted as primary particles or have been growing from newly formed particles for multiple hours. I would recommend using the common classification into nucleation, Aitken and accumulation mode, and modify the interpretation of the results throughout the entire manuscript accordingly.

[2] The authors state that an increased mass fraction of SNA in the larger sizes (80 – 200 nm) during winter and spring and more organics in the smaller sizes (40 – 80 nm) affect the hygroscopicity (lines198-199 and 206-208). Looking at the total organic mass in Fig. 1b the highest values can be observed during summer followed by autumn. One should be careful with these statements as no size-resolved composition was measured. In addition, ON and OS could be present. Is the measured NO_3^- and SO_4^{2-} plainly inorganic?

[3] This is related to comment [1]. The authors state that particles of 40 nm and 80 nm primarily originate from direct emissions or NPF events with limited aging (lines 250-251). These are not in the size range of newly formed particles and can have been aged. In addition, POA can also be observed in the accumulation mode for example from diesel engines.

[4] Which matrix was used to calculate the R^2. It would be helpful to mention which R^2 value is considered a good correlation, or to have an impact on the mean hygroscopicity. This includes for example the statement that the mean hygroscopicity for accumulation-mode particles is significantly affected by κ_{MH} (lines 260-261).

[5] The authors state that traffic-induced compositional changes reduce mean hygroscopicity during rush hours (lines 271-272 and Fig. 5), and that the suppression effect is the greatest during summer (lines 272-273). I am not convinced about this statement. Several sizes and seasons show no decease in mean hygroscopicity during rush hours, but mean hygroscopicity does decrease for some sizes during non-summer months during rush hours. The observed increase in the particle number concentration in winter and spring during rush hours in Fig. 4 is also not reflected during summer.

[6] Lines 287-294: What is meant by gas-to-particle conversion through aqueous-phase oxidation processes? NO_3 radical chemistry? The NO_3 mass fraction in Fig. 4 does not show an inverse diurnal pattern during winter. Could you please elaborate on that? How was it concluded that only accumulation-mode particles are affected? The 200 nm particles in Fig. 5 do not show the bimodal distribution stated, nor does the NF_{MH} increase.

[7] How were NPF days and events identified? Figure 4a2 does not clearly show a banana-shaped diurnal cycle indicating nucleation events (lines 295-297).

[8] I do not see the gradual decrease of MF_{POA} in Fig. S1.

[9] What is meant with mean hygroscopicity increases slightly as the particles grow (lines 308-310)? There is no difference in non-NPF and NPF days for mean hygroscopicity of 40 nm particles.

[10] Not for all sizes a distinct diurnal peak is visible at 16:00 LT in Fig. S2 and Fig. S3. The same applies to NF_{MH} (lines 312-313). I don't think the conclusion in lines 313-315 can be drawn from Fig. S2 and Fig. S3. The mean hygroscopicity does not change throughout the day for the different particle sizes for both non-NPF and NPF days.

[11] Which figure shows the results mentioned in lines 319-322?

[12] The conclusions in lines 335-341 are confusing. How can there be a size-dependent behaviour for one particle size?

All the results in section 3.2 should be re-interpreted taken comment [1] into account.

[13] Line 349-350: "…C2 exhibiting substantially lower concentrations than C1 and C3 (Fig. S4)." Concentrations of what? For a better understanding of Fig. S4 it would be nice to mention in the main manuscript that the total mass is represented by the size of the pie chart, not only in the caption. Even better would be to present the actual mass concentration in a table or in Fig. S4. I don't think the conclusion in lines 352-353 can be drawn just from the $PM_{2.5}$ mass concentration. Looking at summer for example C2 also shows lower mass concentrations compared to C1 and C3, but nucleation events occur only at frequency of around 3% according to Table S2.

[14] The influence of NF_{NH} and NF_{MH} during all seasons except autumn seem to be the same for 40 nm particles (line 380).

[15] Unfortunately, only the back trajectories for autumn were available, but looking at those all clusters show long-range transport. How does enhanced photochemical aging lead to more internal mixing (lines 388-390)?

[16] "…lower hygroscopicity than in other areas…" Which areas is it compared to?

[17] Which meteorological conditions are you referring to in line 436? Temperature, wind speed, wind direction, and RH for example are not mentioned in this manuscript. Local emission sources, besides traffic emissions were not linked to aerosol properties (lines 439).

Other comments

Line 30: …suspended in a gas… is the commonly used definition.

The HTDMA and CCNC measure in different saturation regimes. Thus, comparison of hygroscopicity measurements in the HTDMA and the CCNC is meaningless (lines 43-50). Please modify.

It would be nice to mention the ACSM in the introduction as it is used throughout the entire manuscript.

Some statements are vague or confusing, for example lines 32-33, lines 40-41, lines 104-105, lines 223-224, lines 241-242.

Line 212: 40 nm particles during winter and summer also show similar hygroscopicity in Fig. 1a

Line 230: "…possesses greater hygroscopicity." compared to what?

Line 231: "…more pronounced seasonal contrast." compared to what?

One should be careful with words like significantly or substantial (for example lines 231, 261, and 289). Please check throughout the manuscript.