General Comments: Hygroscopicity and volatility are the key properties of atmospheric aerosols that can significantly impact the climate directly by interacting with solar radiation and indirectly by affecting cloud microphysics. Hygroscopic aerosol components can uptake substantial water under sub-saturated conditions and thus can significantly change aerosol size distribution and promote both heterogeneous and aqueous-phase reactions. Severe haze event caused by high mass loading of aerosols is one of the most critical environmental issues faced by China. Although the underlying cause is still an area of active research, it is well recognized that ever-increasing economical expansion and demands for energy have led to tremendous emissions of primary air pollutants (e.g., VOCs, NOx, SO2) in China. Many mitigation measures have been proposed to reduce air pollutant emissions but their effectiveness still needs to be verified in practice. The "Victory Day Parade" event has provided the atmospheric scientists such an opportunity to examine the aerosol properties with/without those anthropogenic emissions. Therefore, this dataset by itself is a valuable contribution. The manuscript is well written and is certainly within the scope of ACP. The measurements techniques are well established and the methodology is generally sound. Overall, the research was well planned and carefully executed. I would recommend the manuscript for publication in ACP after the authors address the following comments.

Specific Comments:

1. L231: As the authors pointed out that "Air quality has a strong correlation with local wind direction in Beijing", how did the authors manage to separate the effects of meteorological conditions from that of control measures?

Re: You are right. Separating the effects of meteorological conditions is important to analyze the impact of emission control. When selecting the comparing periods, we tried to find the periods of similar meteorological conditions, especially for Clean1 and Clean2 periods. You can refer to Figure S2 and Table S1 in the supplementary material, we have compared the wind and other meteorological variables during different periods, the meteorological parameters were similar, especially for Clean1 and Clean2 periods.

2. L259 and L294: It is interesting to note that PM mass concentration decreased by a factor of 8 between polluted and clean periods while precursors only decreased by less than 50%. Please comment on this.

Re: This is a good point. In practice, the relationship between PM_1 and precursors always is not linear. The PM_1 mass concentration is mainly determined by the larger particles (Accumulation mode particles), most of them are from condensation of fine particles and direct emission. Many control measures (such as stopping construction activities, shutting down or limiting factory production) would directly decrease the PM_1 emission. However, the particles converted from gas precursors always are the fine particles (Aitken nuclei mode), which have a smaller contribution to PM_1.

3. L311-314: The authors may also consider the possibility that during daytime strong vertical mixing can bring down air masses transported from long distance that were more aged. However, during nighttime thermal inversion would cap the ground level, where fresh primary emissions would dominate.

Re: Yes, during nighttime the increase of hydrophobic species (like BC) from primary emissions and thermal inversion would make BC accumulation, these factors would decrease the aerosol hygroscopicity. This has been addressed as "In the evening, thermal inversion would cap the ground level and a number of low hygroscopic primary particles (like black carbon, BC) emitted from local diesel trucks and heavy-duty vehicles results in the decrease in κ_{mean} during nighttime" in the revised version of the paper (see L312-315).

4. L319: How did "H2O2" form during nighttime? This is more likely due to N2O5 chemistry.

Re: The heterogeneous reactions in the atmosphere are complex, the reactive material includes H_2O_2、HO_2、N_2O_5、O_3 and so on. At night the formation of NO_3 and N_2O_5 becomes important, NO_x can be oxidized to NO_3 through heterogeneous reactions. NO_3 and NO_2 can be further combined to N_2O_5. Then nitrate can be formed rapidly through NO_3 and N_2O_5. This rapid conversion enhances the available nitrate and may add significantly to the nitrate available for condensation, enhancing night-time concentrations compared to those observed in the day (Dall'Osto et al., 2009). This has been addressed as "NO_x could be transformed into hydrophilic nitrate rapidly through NO_3 and N_2O_5 (Dall'Osto et al., 2009)" in the revised version of the paper (see L320-321).

5. L324-330: "During NPF events, …condensation of VOCs". Did the authors mean that these NPF events (Clean1 case) were caused by organic precursors? If these organics were less hygroscopic, why did kappa-mean increase? Was there any possibility that these 40 nm particles were due to primary emissions, such as automobile exhaust or cooking?

Re: Yes, we think organic cursors may take some role during NPF in Clean1 case. Note that the hygroscopicity of 40-nm particles during Clean1 period had a "slight" increase, this was likely caused by the increase of OA oxidative level. The 40-nm particles can be from both growth of new formed particles and primary emissions. This has been addressed as "…40-nm particles from local sources were always hydrophobic and a very small amount of hygroscopic particles were produced through the nucleation and growth from gaseous precursors" in the revised version of the paper (see L326-327).

6. L377: "With the processes of…(i.e., SFmean increases)." Why did the aging, coagulation and growth processes cause decrease in particle volatility if the precursor gases were the same? This is more likely due to the formation of more oxidized oxygenated organic aerosols.

Re: Yes. The aging, cogulation and growth processes can enhance the oxidative level of organics, and there are more refractory organics (like polymer-type organics) produced. This has been addressed "With the processes of particle aging, collision, and growth, they then decrease in volatility (i.e., SFmean increases). This is because these processes can enhance

the oxidative level of organics and there are more refractory organics (like polymer-type organics) produced." in the revised version of the paper (see L377-380).

7. Figure 8: How was the linear fit calculated for each size? Did the authors try orthogonal distance regression (ORD), which I believe will generate more reasonable results especially for the 40 nm case?

Re: Thanks for your advice. In this paper, I used the least square fitting for each size. Here I tried to use ORD method to the linear fit (Figure 1.). The result by ORD method is similar to our linear fit results.
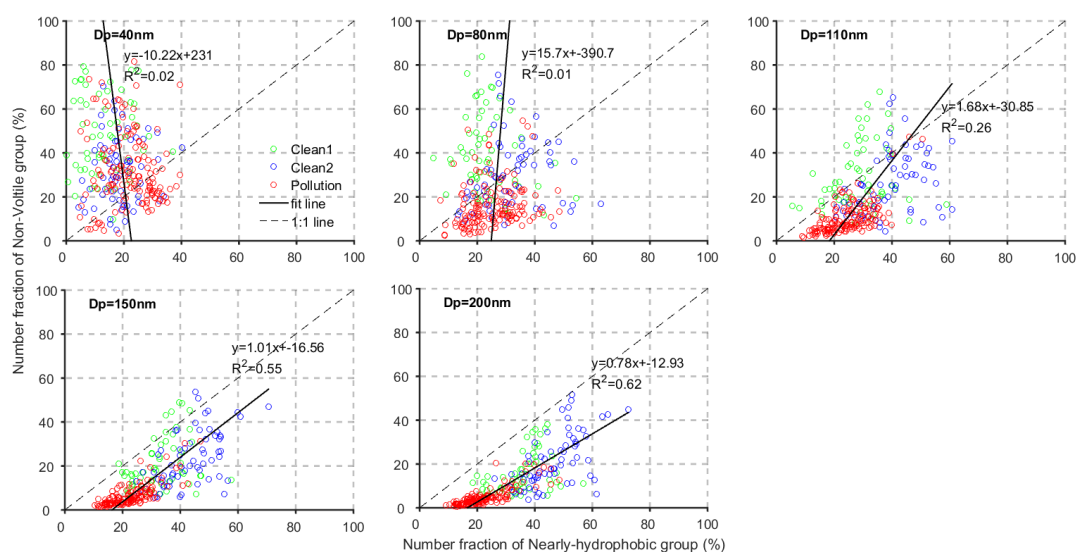

Figure 1. Comparisons between the number fractions of the nearly-hydrophobic group (NF_{NH}) and the non-volatile group (NF_{NV}) with orthogonal distance regression (ORD) fitting method.

Technical comments:
1. L138-147: remove period before semicolon;
   Re: Revised, thanks! This has been addressed in the revised version of the paper (see L140-149).
2. L248: Particle mass concentration is denoted by "" throughout the manuscript, which, however, could be misleading, since "" is commonly used to represent density. Please replace ""with "m" or "mass" or something less misleading.
   Re: Revised, thanks! This has been addressed as "$PM_{10-400\ nm}$" in the revised version of the paper (see L250)
2. L376: dominated by sulfate and "organics" not "VOCs".
   Re: Revised, thanks! This has been addressed as "Wehner et al. (2009) also showed that ~97% of newly-formed particles are volatile because they are dominated by sulfate and organics." in the revised version of the paper (see L376-377)
3. L459: change "corrected" to "correlated".
   Re: Revised, thanks! This has been addressed in the revised version of the paper (see L462)

References:

Dall'Osto M., Harrison R.M., Coe H., Williams P.I. and Allan J.D.: Real time chemical characterization of local and regional nitrate aerosols, Atmos. Chem. Phys., 9, 3709-3720, 2009.