This study investigates the pollution characteristics and formation mechanisms of sulfate and nitrate during the winter haze pollution periods in Beijing in 2016 based on the field observations, which is helpful for us to understand the winter haze formation in China and better control it. However, some discussions are confusing. This paper cannot be accepted before the authors have addressed the following comments.

1. Line 257-258: The variation of NO_2 should be given in Figure 1, because the discussion in this study is based on NO_2, not NO_X. Are the concentrations of SO_2 a factor of 5 lower than the concentrations of NO_2? Based on Table 1, it's not true.

2. Line 262: NOR is commonly defined as "NOR = NO_3^- / (NO_3^-+NO_2)" in the previous studies. Why is "NOR = NO_3^- / (NO_3^-+NO_x)" used in this study? We know that NOx is usually much higher than NO_2, especially at night. Are the discussion and results different if you use "NOR = NO_3^- / (NO_3^-+NO_2)" in this study? If you use "NOR = NO_3^- / (NO_3^-+NO_x)", why do you use "NO_2*O_3", "Dust*NO_2" and "HONO*DR*NO_2" in the following discussion, rather than "NO_x*O_3", "Dust*NO_x" and "HONO*DR*NO_x"?

3. Line 270-271: Why is the reduction of NOR due to the deliquescence of nitrate? Based on the reference you list, the deliquescence can change aerosol particle size distribution, but not decrease the nitrate concentration.

4. Section 3.3.1: The discussion about the nitrate formation is not convincing and more analysis is needed.

(1) Line 295-299: Is the correlation analysis in figure 3b proper to investigate the contribution of heterogeneous hydrolysis of N_2O_5? Why does a negative correlation exist between NOR and NO_2*O_3 under the RH<60 % condition? It means that the heterogeneous hydrolysis of N_2O_5 is not important under the RH<60 % condition? If the authors use a similar figure with Figure3b to analyze the correlation between NOR with Dust*NO_2 and HONO*DR*NO_2, what are the conclusions?

(2) Figure 3a: Why does NOR decrease obviously during 0:00-4:00 under the RH>60 % condition?

(3) Line 296-297: why is the nighttime defined as 19:00-6:00? Seeing from Figure 3d, DR is nearly zero during 18:00-7:00.

(4) Line 300-302: A similar NOR increase during the daytime can be seen under the RH>60 % condition in Figure 3a. Why are the hourly variations of Dust*NO_2 and HONO*DR*NO_2 under the RH>60 % condition not included in Figure 3c-d. Seeing from the abstract (Line 27-30) and conclusion part (Line 365-368), the authors seem to conclude the gas-phase reaction of NO_2 with OH plays a key role just under moderate RH conditions. How about under the RH>60% or RH<30% condition?

5. Section 3.3.2

(1) Line 325-328: Why is the heterogeneous reaction of SO_2 on the surface of mineral aerosols not important before 14:00?

(2) Figure 4: Why does SOR decrease obviously during 0:00-4:00 under the RH>60 % condition?

(3) Figure 4: Under 30%<RH<60%, why is the SOR during 13:00-23:00 much higher than that in other hours? We know that RH is commonly high at night, for example during 0:00-5:00.