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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Formation mechanisms of atmospheric nitrate and sulfate during the winter haze pollution periods in Beijing: gas-phase, heterogeneous and aqueous-phase chemistry" *by* Pengfei Liu et al.

Anonymous Referee #2

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This study focused on the formation mechanisms of nitrate and sulfate in Beijing, especially the different mechanisms under various RH conditions. The heterogeneous hydrolysis of N2O5 was responsible for the nocturnal formation of nitrate at extremely high RH levels (RH>60%), while homogeneous reaction between NO2 and OH radical dominated the formation under moderate condition (30%<RH<60%). For SO42-, aqueous reaction between SO2 and H2O2 attributed to its formation under high RH condition. The target of this study is meaningful to understanding the formation mechanism of nitrate and sulfate in real atmosphere. There are several questions not very clear.

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Discussion paper

Comments: 1. Please give a brief description of NOR and SOR in abstract. 2. Did NOR and SOR represent the secondary formation of NO3- and SO42-, respectively? Actually, when NOx and SO2 reached zero, the value of NOR and SOR were closed to the maximum. If NOR and SOR represent the secondary formation of NO3- and SO42-, secondary formation of NO3- and SO42- showed up with low concentration of NOx and SO2. This result is confusing. 3. The authors mentioned that "The reduction of NOR might be due to the deliquescence of nitrate at atmospheric RH around 60 %" at line 270-271. However, the deliquescence of nitrate would not reduce the nitrate in particle but change its phase state. RH has been validated to affect the heterogeneous reaction of NOx and HONO, which may result in the reduction of nitrate at high RH condition. 4. One N2O5 could be generated by two NO2 reacting with one O3. Hence, is it more suitable to use [NO2]ˆ2 $\times$ [O3] rather than [NO2] $\times$ [O3] for representing the heterogeneous hydrolysis of N2O5 to atmospheric nitrate at night? 5. Though HONO is a main source OH, the diurnal variation of HONO may be different from OH radical. Have the author ever analyzed the correlation between DR $\times$ NO2 and NOR? Because the diurnal variation of OH radical should be highly correctly with radiation.

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