Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2018-89-RC3, 2018

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Summertime fine particulate nitrate pollution in the North China Plain: Increasing trends, formation mechanisms, and implications for control policy" *by* Liang Wen et al.

Anonymous Referee #3

Received and published: 21 April 2018

Fine particulate nitrate pollution has been found to play more and more important role in haze pollution in China. This paper reports measurement results of nitrate and relevant species at three distinctly different sites in the North China Plain, the most polluted region in eastern China, and interprets the main daytime and nighttime formation mechanisms of nitrate and discusses its implications for air pollution measures in this region. This paper gives very important insights into the formation mechanisms of summertime fine particulate nitrate and into the control policy of haze pollution in China. It was very well organized and written and can be accepted for publication in

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Discussion paper

ACP as the following points are addressed.

Major points: 1)The difference between the Mt. Tai and ground surface sites as well as its implication need to be highlighted. The Mt. Tai site locates around 1465 m a.s.l., which is almost near the top of planetary boundary layer (PBL) in summer. This site is not only a “remote site” in this region, but also can provide more insights into the different chemical mechanisms inside or above the PBL, or in the nocturnal PBL and the residual layer. These issue need to be sharpen in the data analysis or in the discussions.

2)For the MCM modeling of episodes, the model was run at observational-based mode (OBM). Available measurement data, including nitrate, were used as the model inputs. This method of course could help identify the ongoing chemical processes in the air masses, but it is difficult to trace back to the historical contribution of chemical processes. For example, the observed NH4NO3, already existed as initial condition, could be converted into HNO3 through thermodynamics and further cause an “artificial” mechanism from HNO3 partitioning. Is that possible to do some sensitivity test by removing or reduction the observed nitrate concentration in the MCM OBM? Otherwise, the authors should mention the weakness or uncertainty of the observational-base modelling when they interpret the modeling results.

Minor points:

1)Please use same scale in Y-axis for the comparison of results from different sites, such as Figure 2, Figure 6 and Figure 7. I understand that the authors would like to highlight some peaks in each panel. However, it is more important to make a comparison between different sites.

2)About the trends of nitrate/PM2.5 and nitrate/sulfate in Figure 3, can we also show the trends of nitrate, NO2 and O3 concentration if the data are also available?

3)References of MARGA measurement: Please add some references of measure-

ments based on this instrument, especially those done in the high aerosol loading environment in China.

4)Page 7, Line 1 and Line 12-14. “Mixing layer height” and “boundary layer height”, please use consistent words. In addition, the boundary layer height not only “affects dry deposition”, the boundary layer height (or mixing layer height) determines the dispersion capacity of air pollutants emitted from ground surface.

5)Page 9, line 4-5. The uplifted PBL: the developed PBL or uplifted PBL height.

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