

Interactive comment on “Role of ambient ammonia in particulate ammonium formation at a rural site in the North China Plain” by Zhaoyang Meng et al.

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Please see our response in the PDF file.

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Discussion paper



Response to comments by editor and anonymous reviewers

We appreciate the editor and anonymous reviewers' comments and helpful suggestions. We have revised the manuscript according to their comments and suggestions. We hope the revised manuscript can meet the quality requirements of *Atmospheric Chemistry and Physics*.

Response to Reviewer #1's comments

Anonymous Reviewer #1

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Overview

This paper as the other reviewer has pointed out potentially has an amazing dataset which is really needed for greater understanding of air pollution and its impacts in agricultural regions. The paper could be hugely improved by moving away from the gas-particle ratio analysis to more detailed atmospheric chemistry and physics which would allow insight into the processes occurring and whether current understanding of emission, transformation and deposition can explain the observations. There is an overuse of "the data suggests..." and "this indicates..." without backup of information.

Answer: Thank you for your comments and suggestions, which are valuable in improving the quality of our manuscript. We have made additional data analysis and revised the manuscript according to the comments and suggestions by both reviewers. To gain more insight into the role of ammonia in the formation of secondary inorganic aerosol, simulations were made using the thermodynamic equilibrium model ISORROPIA II. The measurements were used as input of model to simulate the variations of the components in gas, liquid and solid phases, which are useful in the investigation of the gas-aerosol equilibrium characteristics.

Major comments:**Introduction:**

I think the ambition of the paper (as described in the last paragraph) needs to be more detailed and then the critical analysis done in the paper.

P3 More details of instrumentation is needed, in particular the calibration and response time of the NH₃ instrument is required. Did the authors see an influence on the response time from PM deposition on the inlet and instrument filters (see Bobrutki et al 2009 and other papers for details of this issue). Some raw data and calibrations would be useful – ACP is not figure limited. Though rainfall is mentioned as a key meteorological driver, the method of measurement and the data are not shown at all.

Answer: We have added some more details about the instrumentation and issues regarding quality control. We paid attention to the influences on NH₃ measurements from the inlet and PM deposition on it and tried to reduce such influences. Although we do not exclude some unperceivable influences from adsorption and desorption, these influences should be much smaller than the high NH₃ values we observed and cause mainly slightly slower response or a lag in the recorded NH₃ concentration, which may not impact our analysis based on hourly average data. Some figures are added in the revised

Fig. 1.