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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Trends in atmospheric ammonia at urban, rural and remote sites across North America" *by* Xiaohong Yao and Leiming Zhang

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Response to Reviewer 2

We greatly appreciate the reviewer for providing the comments which have improved the paper. We have addressed all the comments carefully, as detailed below.

Title: Trends in atmospheric ammonia at urban, rural and remote sites across North America Journal: Atmospheric Chemistry and Physics Manuscript Number: acp-2016-259-manuscript-version2

Comments: This is an interesting paper, in which the authors attempted to compile a large set of measurement data of gaseous ammonia and particulate ammonium at

fourteen sites including four urban sites, four remote sites and six rural/agriculture sites distributed at different latitudes in USA and Canada. The authors used two statistical trend analysis techniques to examine trends in atmospheric levels of ammonia over time. The analysis on the role of temperature on ammonia levels is also addressed in this work. Overall, this is a good work that will be beneficial to the global scientific community to get the insights into the trends of atmospheric levels of ammonia. However, the article needs to address some minor issues as per the specific comments given in this report i.e. minor revisions are needed before this paper can be accepted for publication.

In the manuscript, it was found that strong scientific inferences are stated without support of proper literature citation. E.g., L206-209, L209-211. The authors are requested to fix these kind of issues throughout the manuscript.

Response: This part (L206-211 in original version) has been revised as: "The small seasonal variations in NH3 mixing ratio at this site were caused by two contrasting factors in winter season. On one hand, extremely low temperature limited soil/vegetation NH3 emissions to a level close to negligible (Zhang et al, 2010), as was also seen at Site 1 at ambient temperature <-9°C (Hu et al., 2014). On the other hand, NH3 emissions from industrial and/or non-industrial anthropogenic sources seemed to be enhanced in winter (Lillyman et al., 2009; Behera et al., 2013), as was supported by the two to four times higher mixing ratios of SO2, HONO and HNO3 in winter than in summer."

We have checked through the whole manuscript and revise these accordingly. Please see highlighted parts in the revision.

At several places of the manuscript, it is mentioned in a bracket that figure not shown. It would be better to remove such words.

Response: Deleted.

L303-305: The analysis of data with proper interpretation should be done to support such statement.

Response: The correlations between atmospheric NH3 and ambient temperature and between their long-term trends are presented in Sections 3.1 and 3.3. The relationships between NH3 emissions and ambient temperature and between NH3/NH4+ partitioning and ambient temperature have been well documented in literature. Here, we just summarized those findings and analyzed multiple factors which could affect the observed trends in atmospheric NH3.

To avoid confusion, we have also revised the sentence as " Increasing T not only increases soil/vegetation NH3 emissions but also favors more NH3 partitioning in the gas phase (Pinder et a., 2012; Sutton et al., 2013), both processes would increase NH3 mixing ratios."

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