

Interactive comment on “High resolution inventory of re-estimating ammonia emissions from agricultural fertilizer in China from 1978 to 2008” by P. Xu et al.

Anonymous Referee #1

Received and published: 14 October 2015

General Comments:

This is an interesting and well-written manuscript describing the development of a higher spatial resolution emission-factor based ammonia inventory. I particularly appreciated the policy-focussed trend discussion. This is a potentially important contribution for air quality modeling in China, but beyond comparison to previous inventories, it is missing discussions of the validity of many of the assumptions needed for its development beyond “it is what was done previously.” It is also lacking comparison of emission estimates to observations, but adequate data sets may not be available. The article listed below may not have been available at the time this draft was first written,

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but I think it is important to include some discussion of this alternative method as it compares to the one in this paper. What are the strengths and weakness of the two methods? Are there situations where one method should be preferred over the other? I am particularly interested in the authors' thoughts on the implications of bidirectional ammonia flux on their inventory estimates. I recommend publication with this addition and consideration of the detailed comments that follow.

Fu, X., S.X. Wang, L.M. Ran, J.E. Pleim, E. Cooter, J.O. Bash, V. Benson and J.M. Hao, 2015. “Estimating NH₃ emissions from agricultural fertilizer applications in China using the bi-directional CMAQ model coupled to an agro-ecosystem model. Atmos. Chem. Phys., 15: 6637-6649; <http://www.atmos-chem-phys.net/15/6637/2015/>.

Detailed Comments:

1. I suggest shortening the title to “High resolution inventory of ammonia emissions from agricultural fertilizer in China from 1978 to 2008”
2. Pg 25304, line 5. Please describe “straw returning” as an emission source.
3. Pg 25303, line 13. Does the function “f(.)” maintain a constant, climatological shape through time for each region, or does it respond to interannual weather variability? Please add to text.
4. Pg 25304, line 3. “We obtained the 2008 unavailable fertilizer, crop. . .” The sentence needs clarification. How can you obtain unavailable data?
5. Pg 25306, line 3. Is “the CV of each activity data in 1978-2007 is equal to the CVs of the 2008 data” a good/valid assumption?
6. Pg 2506, line 9. Did you test the activity data to see if the normality assumption is valid?
7. Pg 2506, line 20. The use of ammonium bicarbonate (ABC) is interesting as regards Green House Gas (GHG) production since it breaks down into CO₂, water and NH₃.

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You mention that China is moving away from this form of synthetic fertilizer. Could that result in a CO₂ emission decrease? Less nitrogen application should result in reduced N₂O emission (another GHG), but also could reduce a potential rural source of NO which might also affect ozone concentrations. Many possible nitrogen emission and air quality interactions are linked to fertilizer use. Will your inventory be able to respond to changes in these factors in a physically realistic manner? Will you be able to untangle the various interactions? Can you use this inventory for future projections?

8. Pg 25312, section 4.1. Nice comparison to previous inventories. Is your method "better" or just different from the others? Do you have evidence that the higher spatial resolution is giving you more valid information as opposed to a larger number of poor estimates? Comparison of your emission estimates with satellite data is a good start, but is not sufficient because of the limitations you mention. Are there ground-based flux measurements available for any locations that you could compare with your source inventory? If not, would that be a good recommendation for future government investment?

9. Pg 25314, line 20. Please clarify this sentence. What do you mean by "...replaced by compound and organic." Isn't ABC a compound fertilizer?

10. Does the current inventory need further improvement, i.e., future direction of inventory research? Is there a need for field campaigns in China? I think you make a very valid point that using research findings based on European farming systems is not necessarily what is needed to understand agricultural ammonia emissions from Chinese crop and livestock management systems.

Technical Comments:

1. Figure 2, Use the same scale and font size on figure A and B legends. Larger is better.

2. Figure 3, Define "RDs" in caption.

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3. Figure 4. "Monthly NH₃ emissions in 2008 as compared with previous inventories"? Are these field studies or previous inventories for China? In caption, please include the date for the reference. There are many Zhang et al's and Huang et als in your references.

4. Figure 5. Please define R50 either in the text or in the caption.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 25299, 2015.

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