

## ***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 #2**

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General comments:

This is a very interesting manuscript that develops a new fertilizer NH<sub>3</sub> emission inventory of China (CAF\_NH<sub>3</sub>) and also reports the temporal trends for 1978–2008. The authors explain a detail of the relationship between the NH<sub>3</sub> emission patterns and government policies, which is an important factor of developing a practical and precise NH<sub>3</sub> emission inventory of China. I really like this section. I have three main comments. 1) A high resolution NH<sub>3</sub> emission inventory based on the county-level activity data is developed for 2008. While the NH<sub>3</sub> emission inventory for 1978–2007 is based on the province-level activity data. In the manuscript, a sensitivity test of NH<sub>3</sub>

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emission spatial patterns to input of activity data demonstrates that the province-level activity data could bias the total emission and the spatial variation. Then, how much confidence could we have on the results of 1978–2007 that based on the province-level activity data? This point should be well explained in the text. 2) The bi-directional flux of NH<sub>3</sub> hasn't been discussed in the manuscript. Zhu et al. (2015, acpd) shows there are large impacts on NH<sub>3</sub> emissions in eastern China when including the bi-directional exchange processes in the model. I think including the bi-directional flux in this emission inventory could be a great improvement. Although the authors may not able to finish the work in this manuscript, it should be discussed at least. <http://www.atmos-chem-phys-discuss.net/15/4823/2015/acpd-15-4823-2015.html> 3) Beside the previous studies of estimating emission inventories, satellite measurement is a good resource to evaluate the spatial distribution of NH<sub>3</sub> emissions inventory. The comparison of the satellite data and this study is not shown. There are many satellite data can be used, such as TES, IASI. I'm interested to see more results and discussions according to the comparisons to satellite data. Overall, I suggest publishing this manuscript after revision based on the comments above and below.

Specific comments:

Page 25300, line 10. You don't have the spatial pattern for 1978–2007.

Page 25301, line 14. IPCC, 2006 is not the right way to cite.

Page 25301, line 26. I'm not clear about the logic. Do you mean to achieve the balance of food demand and environment effects?

Page 25302, line 12. You have to list these “specific sectors”.

Page 25302, line 12–13. I guess you miss “in the year” after “temporal distributions”.

Page 25303, line 21–23. So have you used data for Hong Kong and Macau or not? Please rephrase the sentence.

Page 25305, line 6–7. Please list these “specific parameters”.

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Page 25305, line 17. So, in this study, did you use the same EFs for all seasons or not? Please rephrase the sentence.

Page 25306, line 5-6. Please explain the reason or list the reference for the assumption of "0.2" right after this sentence.

Page 25307, line 16. Add "from Infrared atmospheric sounding interferometer (IASI)" after "monitoring".

Page 25307, line 18. What "those" stand for? Please clarify here.

Page 25307, line 20. Do you want to say, "not all the higher emission areas were observed by satellite because of cloud . . ."? Actually, satellite is more able to observe high emissions than low emissions. The factors you mention here all could lead the inconsistent between satellite monitoring and your inventory, but do you know which is the main possible reason? It may vary for different regions, but you should at least explain more for one typical region for an example.

Page 25307, line 23-25. Are you still talking about findings from satellite observations? What is "emission density"? Do you mean high NH<sub>3</sub> emissions or concentrate areas with high NH<sub>3</sub> emissions? It is hard to image without a figure.

Page 25308, line 21. Add "of the annual total emissions" after "39.7%".

Page 25309, line 9. "Fig. S3": It is better to use the same color scale for all plots.

Page 25309, line 12-13. What kind of "temperature variations"?

Page 25310, line 13. What does "CAY" stand for?

Page 25310, line 24. Change "first decreased" to "decreased in 2007".

Page 25311, line 9. What are the "others"?

Page 25311, line 11-13. Please rephrase the sentence.

Page 25312, line 22-23. "Higher"? I see lower.

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Page 25312, line 23. Change "temporal distribution for" to "monthly variation of".

Page 25312, line 25. Add "(Figure 4)" after "Zhang et al. (2011)".

Page 25312, line 25. What does "the other" stand for?

Page 25312, line 28. I'm confused here. Which three? I thought "all three studies" are three previous studies. However, as I read the later sentence "however, Paulot et al . . .", it seems that "all three studies" are Huang et al., Zhang et al., and this study.

Page 25313, line 9. "Emissions". Do you mean total emissions? Should you only compare the LS+SF for these two studies since Paulot et al only has LS+SF?

Page 25313, line 12. I don't think the reason has been fully explained. Please finish the explanation.

Page 25313, line 18. Urbanization rate is the average rate of change of the size of the urban population over a period of time. If the urbanization rate is 52.5% in 2008, urban population may be 100% in 2009. I guess 17.9% and 52.6% are urban population, not urbanization rate.

Page 25314, line 11-12. Please rephrase the sentence.

Page 25314, line 26. Change "decrease CAF\_NH<sub>3</sub> emissions" to "decrease the NH<sub>3</sub> emissions from agricultural fertilizers". I think the point is to decrease practical NH<sub>3</sub> emissions, not the NH<sub>3</sub> emission inventory CAF\_NH<sub>3</sub>.

Technical comments:

Page 25302, line 22. Add "," after "uncertainty".

Page 25302, line 23. Delete "the findings of".

Page 25303, line 19. Change "5" to "5 types", "livestock types (8)" to "livestock (8 types)", "crop types (17)" to "crop (17 types)".

Page 25304, line 3. Add "." after "2009)".

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Page 25305, line 14. Add “the” between “is same”.

Page 25306, line 2. Change “to determine” to “determining”.

Page 25307, line 11. Change “or” to “and”.

Page 25307, line 13. Change “or” to “and”.

Page 25309, line 18. Change “from” to “based on”.

Page 25309, line 25. Add “,” after “In addition”. Add “of” after “because”.

Page 25313, line 19. Add “.” After “(2009)”.

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