

Comment on acp-2021-439

Anonymous Referee #2

Referee comment on "Improved gridded ammonia emission inventory in China" by Baojie Li et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-439-RC2>, 2021

This manuscript presented a new bottom-up estimate of ammonia emissions in China that emphasized some improvements on the estimates of fertilizer application-induced ammonia volatilization. The authors compared their Chinese ammonia emission inventory with a commonly-used emission estimate (MEIC), and evaluated the resulting model simulations using the WRF-Chem air quality model with surface and satellite ammonia measurements.

The manuscript is in general well conducted and organized, and it meets the scope of ACP. I have some comments below that suggest the authors better clarify the improvements of this ammonia emission inventory relative to previous studies. I think these comments should be addressed before considering publish.

Specific comments:

1) Page 5:

It appears that most of the methods and datasets applied in this NH₃ emission inventory have followed previous studies (Huang et al., 2012; Kang et al., 2016; Zhang et al., 2018), except here as described in this section the improvements on fertilizer application-related NH₃ emission estimate. It is important to better identify the fertilizer application timing and proportion throughout the planting growing season. The key improvement in this ammonia emission inventory is depicted in Figure 1 that accounts for the spatial differences in fertilizer application timings for the three main crops (maize, wheat, and rice). From Figure 1, it is not clear what these fertilizer application dates are for each crop and each region. I think this information shall be presented, e.g., as a table in the manuscript or in the Supplement.

In addition, how the fertilizer amounts are distributed in each month according to the application timing needs some description in the text. Did you use a uniform fertilizer application rate for each crop in each month and region?

2) Page 9, Section 2.4:

The results of Monte Carlo calculation were not presented in the manuscript. What are the uncertainties and probability distributions of ammonia emissions from fertilizer and livestock?

3) Page 17, Section 3.4:

The study pointed out that Chinese ammonia emissions are high in summer and low in winter, and confirmed the results using WRF-Chem model simulations and ammonia measurements. This result did not seem to be much improved compared with previous estimates that all suggested higher ammonia emissions in summer than winter. I think that only analyzing the two months (January and July) could not provide sufficient information on the improvements of the ammonia emission inventory. The new fertilizer-induced ammonia emissions (Figure 5) also high values in April and October? Can you also evaluate improvements in these two months? This will provide valuable information to understand ammonia in spring and fall seasons.

4) Page 18, Fig. 6:

The color scale for the left panel of Fig 6 could be misleading. It shows that at many sites, the model results are too high over the North China plain, however, the model results (contours) and measurements (dots) have different color scales. Suggest put them on the same color scale.

5) Page10, Line 220:

Here "9.29-15.54 Gg" should be in unit of "Tg".

6) Page 11, Line 245:

"replacing complex fertilizers with ABC might reduce fertilizer type-related NH₃

emissions". Should here be "replacing ABC with complex fertilizer"?

7) Page 17, Line 337:

" $R^2=0.85$ " should be 0.84 as shown from Table 4. Was the R^2 value calculated by integrating January and July measurements?