

Review of

Modeling Atmospheric Ammonia using Agricultural Emissions with Improved Spatial Variability and Temporal Dynamics, Ge, et al.

The MS deals with modelling of ammonia emissions from agriculture and allied sector. They use a new model (a module) by incorporating the additional emission sources as compared to those in the existing models. This is a new attempt and can be considered for a publication in ACP. However, the article needs substantial revision before it can be accepted.

1. The MS is too long and was also a bit difficult to read because of the style of writing. Therefore, kindly consider shortening the length of the article and rephrase the sentences as suggested below, to the least. I have given only some examples. Please go through the entire article and check.
2. I thought one more year is needed to test the new model so that seasonal cycle can be tested and inter-annual differences can be examined. If you have the additional model runs, please include and discuss.
3. There are a number of statements about IASI measurements. Perhaps, you could invite one of the IASI team members as an author. This would improve the content of the article. It is just a suggestion.
4. I find the improvement (the difference too) is mostly for the simulations for Germany, not for other countries. Is there any reason for this?
5. Use either "Deutschland" or "Germany" throughout the article, but do not mix both.
6. Other specific comments are given below and please attend them carefully.

Page 1

Line 12: unavailability of measurements? Many satellite-based measurements are available (TES, IASI, CrIS, AIRS, and TANSO-FTS)

Line 22: Benelux means all three countries, then clearly state Belgium, Netherlands and Luxemburg

Line 24-26: difficult to understand, please rephrase the sentence

Line 30: "and model simulations"

Line 31: What about other European countries?

Line 29-32: Please state the reason for the differences.

Page 2

Line 9: I thought biomass burning contributes significantly (13-16%).

Line 17: "they" means PM?

Line 19: what is radiance balance?

Page 3

Line 20: "Level 1 Category"

Line 21: "application of the model results"

Page 4:

Line 6-9: Then we evaluate the model results by comparing the simulated total column and surface concentrations of ammonia with ..

Line 8-10: Finally, we evaluate the model performance with respect to improvements and shortcomings of the modelled results ..

Page 5

Line 1: this is a repetition of an earlier sentence

Line 5, 7: Two model runs were performed

Figure 2: please write "application"

Page 7: Line 2: What is "expert-based judgement" here?

Page 8

Line 2: Please state how much ammonia emits from the traffic sector (in %)?

Page 10: Line 26-29: please rephrase, I did not understand this sentence.

Page 11, Line 1: You mean, no previous research studies?

Line 14: "from to" delete "to"

Page 12, Line 4-5: How much impact that would make on the results, if you drop the constant for simplification?

Page 15: Line 1, what is "high lower critical temperature"

Page 15: Line 13, "showed a good agreement "

Page 16: Line 8: What does it mean by, “but it is not sufficient for real time monitoring?”

Page 16, line 9-10; Instead of this sentence, you can write the accuracy of the satellite product. This is a validated satellite instrument. Alternatively, you can give the details in Section 2.5.2

Page 17, line 8: If the uncertainty is 1000%, how can we use/trust the data or results? I thought the uncertainty is in the range of 25-50%, depending on the region. Perhaps, you need to check the IASI validation papers again.

Line 9-11: Yes, I agree. Thermal contrast might induce some uncertainty. However, the IASI validation team has recommended only the daytime measurements for scientific analyses. Please refer the IASI validation papers.

Line 18: weighted mean or weighted average

Line 31: you mean “poor classification of emissions in the MACC”?

Page 18: Line 6, “increases” instead of ascends

Line 7: scaling “we applied”

Table 1: Can we say that the emissions updated are not very different from the original, except in Germany? Is there any reason for this?

Figure 4: Too difficult to see the x and y - axis entries (please enlarge the font size). Please consider improving the other figures too.

Page 21: Line 1: please write just the “IASI measurements” as you have already mentioned other details (version, algorithm, etc.) in the data and method section

Line 6: measured “validly mostly in ”? Please rewrite

Page 21: Line 7-9: If you have selected the measurements in accordance with the validation guidelines, then all measurements are valid and good for scientific analyses. Why do you want to write again about the validity?

satellite foot-prints and strips: the satellite measurements are on certain latitude/ longitude grids and you need to process the data accordingly. Therefore, this is an issue of data processing, not a problem of satellite measurements.

Page 34, Line 8: “we will make use of”, and delete more

Page 34, l 26-27: Besides, soil moisture, workability and trafficability might improve the..... Please rephrase this sentence.

Page 35: Line 3-5: What is more, because only modeled ammonia columns at overpass time are selected for averaging, ... Please rewrite it.

Page 35, 5-6: Dammers et al. (2016) found that the validity of the IASI product is quite limited because the satellite retrievals are biased. This statement is vague. Please provide details of the bias (e.g. region, period of comparison, compared measurements, etc).

Page 36

Line 2: The other reason could be the threshold of De Martonne-Index applied to the area of interest. Please give details of this.

Line 13: "Ideally" is enough

Line 14: "would be most optimal in this paper", is this topic discussed in this paper?

How much is (ammonia emissions) from the manure transport?

Line 26-27: "The distribution of annual emission obtained from the updated model is similar to that from the original MACC-III model". However, you have stated that the model has improved. I am confused, what is the improvement then?

Page 41: Why the indices are very high at the end of the year?
