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Atmospheric Chemistry and Physics Discussions

Interactive comment on "High-resolution ammonia emissions inventories in China from 1980–2012" *by* Y. Kang et al.

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This is an interesting paper describing an extension of the earlier inventory published in 2012 (Huang et al. in Global Biogeochemical Cycles) towards a longer time period and with a few modifications of the emission factors used. The approach uses gridded emission factors on a monthly basis, and that is an important improvement compared to annual emissions. This way atmospheric chemistry-transport models can better simulate the fate of the atmospheric ammonia and aerosols. Hence, I think this paper is an important contribution. However, there are a few issues that need to be improved in terms of method description. The paper as it is now does not provide sufficient information to understand how the inventory has been constructed, and only by going back to the 2012 publication readers can understand how the monthly emission factors

have been calculated.

For example, it is not clear how the emission factor for synthetic fertilizer use has been calculated. My guess is that the authors have a crop calendar with data on timing of fertilizer application. The 2012 paper mentions that a range of different crops are considered, but this information is missing in the current text. Also, it is not clear how then, for fertilizer use in a specific month, emissions are calculated; is it a flush, or is the emission extended over a longer period (the same comment is for all other sources)?

In section 2.2 on livestock waste there is the same problem of lack of information to understand the approach. In addition, I wonder if wind speed is also used for this source, since it is also soil-borne for grazing and spreading –related emissions. I also wonder how the authors can assume that the parameters used to compute TAN have not changed. I guess that the feeding situation has changed in the inventory period, so that the composition and amount of manure or N excretion per kg of product or per animal probably has changed significantly. So a brief discussion on the impact of this assumption is needed.

Finally, I wonder how the authors can use monthly temperatures and monthly wind speed as a factor in the calculation of the emission factors. How representative are monthly mean wind speed and temperature, while perhaps maximum day temperature and variability of wind speed are better predictors of NH3 emissions. In addition, there may be an interaction between temperature and wind speed that is not represented in the emission factor approach.

In relation to this I wonder if this inventory is better than the one published earlier. Have the authors tested this claim. I am asking this, because the emission estimates are quite close, and given the uncertainties I wonder if the modifications are really improvements. Also the claim that the approach of this paper is better or more realistic than emission factors that are based on less factors needs some more thinking. I wonder if the authors can show that this is the case. Does the approach of this paper

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result in a better comparison with Paulot et al. (2014)and Van Damme et al. (2014) than the previous version of Huang et al. (2012) and of less sophisticated emission factor approaches? In my opinion the claim that a model is better needs to be supported by evidence.

Finally, I wonder why the authors have tried to generate monthly emissions, but nowhere discuss the temporal variation (likewise, the 2012 Huang et al. paper also lacks such a discussion). It would also be interesting to test if the temporal patterns are changing with the shifts in the different sources?

Minor comments

-Table S1 is copied from the Huang et al. (2012) paper except for the EEA reference which is now more recent. To avoid problems, this needs to be made clear.

-Header of section 2.1.2: the soil pH cannot be a source of ammonia.

-The section 2.1.2 on improvement of the EF for soil pH is not clear.

-A description of the approach for the Monte Carlo analysis is missing.

-It is not clear how the temporal distribution of the other sources has been done.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 26959, 2015.