

Interactive comment on “Quantification and evaluation of atmospheric ammonia emissions with different methods: A case study for the Yangtze River Delta region, China” by Yu Zhao et al.

Anonymous Referee #2

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This paper compares and contrasts two methodologies for estimating emissions of NH₃ in China, and illustrates the consequence through model simulations. The paper deals with an important subject, since the large uncertainties surrounding ammonia emissions need to be understood by modelers and policy experts.

The paper is generally well written, and generally sound, but I miss consideration of many of the factors omitted from the emission estimation procedure. This study basically used temperature, and agricultural statistics, to calculate emission factors (EFs). However, with respect to emissions from livestock/poultry, wind-speed is also a very

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important factor (e.g. Gyldenkaerne et al., 2005, Skjoeth et al., 2011, Flechard et al, 2013). Many other factors should also impact NH₃ emissions, such as radiation, rain-fall (and other precipitation), leaf-wetness, atmospheric stability, large uncertainties in the so-called Gamma factors, or bi-directional exchange in general (Bash et al, 2013, Flechard et al., 2013, Massad et al, 2010, Wichink Kruit et al., 2012).

Consideration of such factors might also help to explain some of the model discrepancies outlined in Section 3, and should at least be considered before trying to explain all such discrepancies in terms of temperature and a few selected variables only.

The authors use meteorology from ECMWF for their emissions, but why not the WRF model, since that is obviously available and is used for their CMAQ runs?

The equations used are generally clearly written out, although it isn't always clear where they are coming from. For example, is it correct that equations 2 & 3 are a mixture of methods from Huang et al 2012 and EEA 2013? On the other hand, I read in various sections of EEA 2013 that temperature functions could not be provided (e.g. chap. 3.D crop production and agricultural soils) If from EEA, then it would also be good to cite the scientific papers underlying the EEA guidelines, and to be more specific as to which sections of EEA are being cited (it is a monster document).

Some other points:

P2. The abstract is rather long, and should be shortened for clarity.

P3, L67. NH₃ is said to react with NO_x, but NO_x usually means NO+NO₂. I think the authors mean HNO₃?

P3, L78-81. The sentence is a little unclear. Clarify.

P4, L112. Methods of including meteorology in NH₃ emissions have been around for some time and should be mentioned, e.g. Gyldenkaerne et al., 2005, Skjoeth et al., 2011, , Wichink Kruit et al., 2012, Bash et al., 2013.

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P5, L148. Another source of human-related NH₃ emissions is pets. As shown in e.g. Sutton et al 1995, 2000, human pets can be as significant as human metabolism with regard to NH₃ emissions.

P6, L168. Using should be used.

P7, L187. Give reference for radiometer

P7, L202. The study of Huang et al 2012 uses a linear relationship between pH and EF. Why is the relation here said to be near-linear?

P7. What is the time-resolution of the EF calculations?

P8, L232. Surely fertilizer application at 15-20cm affects the pH of the soil; doesn't this affect the assumptions made when using global pH data from IIASA?

P9. The basic references of the CMAQ model should be given, not just a web-address.

P10. Which version of MEGAN was used? Did you use data provided by Sindelarova, or did you use the MEGAN model itself? If the latter, a Guenther et al ref would seem more

P10. Again, give reference to the model developers - this time for WRF.

P11. The Lanciki 2018 reference for MARGA is missing.

P15. The citation of Wei et al (2015) is in Chinese, and thus not helpful for most authors. This instrument has been around for many years, and the artifacts documented elsewhere. Please find some citations in English for the problems mentioned.

P28, Use molecule not "mole.", to avoid confusion with the mole unit.

P31. Table 3. Correlation coefficients should be added, and the time-resolution of the statistics mentioned.

P31 cont. for all Tables make it clear if statistics are calculated from hourly, daily or monthly values.

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There are small English misses throughout, for example with regard to singular or plural, or omission of the definite article (the).

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