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***Interactive comment on* “The effect of climate and climate change on ammonia emissions in Europe” by C. A. Skjøth and C. Geels**

Anonymous Referee #2

Received and published: 28 September 2012

Review of MS No.: acp-2012-488 Climate and climate change cause considerable variations in ammonia emissions Author(s): C. A. Skjøth and C. Geels Special Issue: Integrated Land Ecosystem-Atmosphere Processes Study (iLEAPS) (ACP/BG Inter-Journal SI)

This is a nice paper clearly highlighting the importance taking the climate and meteorological conditions into account when estimating and reporting NH₃ emissions. It is also quantitative thereby bridging the gap between "knowing that it should be taken into account to How that could be done". I favor publications but have several remarks / demands for improvement and correction.

The policy relevance could be stressed more clearly. In fact not only relevance, it will also complicate policies as the climate dependence of the emissions will remove the

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“level playing field” in Europe for NH₃ emissions. Still, this is reality and should be discussed – if ignored that should be a deliberate policy choice, not hidden. Or the other way around, warm countries could be allowed to emit more NH₃ per animal unit? This should not be solved in the paper but in the discussion should be at least be mentioned what the impact might be on the EU NEC directive and that harmonizing such an adjusted emission reporting with the NEC is not trivial (as agriculture is by far dominating NH₃ emissions in Europe).

The MS should be checked for English spelling, especially the verbs. Often plural is used when should be singular or the other way around. Example line 11 abstract "vary" should be "varies" (although this reviewer would prefer there "would vary", Sometimes "-ing" is used where the verb should be active. Example line 5 Abstract "investigating" should be "investigate". It is advised to give the MS a read-over by a colleague or editor not on content but on this issue. Related to this is the very frequently used word "here" and "then" where it is often not necessary . Example first line of the abstract or line 11 of the introduction.

Important note: I have reviewed - and made my notes in - the original manuscript as submitted to ACP, this means my line numbers and page numbers correspond to that pdf, it had a much longer abstract - which is improved now . My page & line nr. are not in line with the online version. However, it takes me too much time find the corresponding numbers in the new version. I'm afraid the authors may have to puzzle a bit. I did review the new abstract (see end).

Throughout the MS the authors find it necessary to explicitly list if a citation is from "Nature" or a similar journal. This reviewer is against this, it is unnecessary and suggests that because it is published in e.g. Nature cannot be wrong. It is enough for any scientist to look in the ref list and values that work as seen fit. For example p. 3, l 4: " although the Nature commentary by Sutton et al. (2011b) highlights the high uncertainty on health effects that are related to ammonia emissions. " should be : "although Sutton et al. (2011b) highlight s the high uncertainty on of health effects that

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are related to ammonia emissions. " : Please change all these references including the journal name accordingly.

p3, l 28: These gridded emission inventories are often based on national reported emissions - not on emission factors. Of course emission factors are used by national agencies but they do not go directly into the grid.

p6, l 20: Please be a bit more specific: at what resolution? using what distribution proxy? (land use? animal numbers?) or simply splitting EMEP cells?

Results p7 l24-30 (Fig. 2 shows, not show). More important, I would like to see this more clearly explained. If I understand correctly for every grid cell you calculate what the NH₃ emission would be for a pig stable similar to the standard as in Tange. If that is correct than it is confusing to actually place / mark Tange in the maps, it is irrelevant. At first I thought the maps showed the distribution of emission coming from Tange as it was marked so prominently.

p 8, l10 replace a difference with "range" Table 1. I have a fundamental problem with this table (and possibly how some of it is used in the paper). Given the range you present for small e.g. mountainous countries like Switzerland, Austria - I suspect that the methodology is applied everywhere but surely no pig stable with 1000 pigs is located high in the mountains (inaccessible, very cold). This creates a completely artificial range in the emission variation. If my impression is correct I would ask for some sort exclusion of unlikely altitudes or ecosystems because the created range is unrealistic. This would probably also change the lower boundaries of France and Germany? Later on you state that the biggest range is found for big countries - based on Table 1, I don't agree Austria, Switzerland show equal ranges and of course on a much smaller land area.....

discussion p9. 23-26. not taking climate fully into account... That is correct but based on my previous comment - are the authors exaggerating it by taking unlikely places (like mountain regions) into account? If correcting this would reduce the range, that

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would not make the paper and the outcome less valuable - the range is big enough. In this same section a reference to the NEC (national emission ceiling) directive could be made. The NEC for NH₃ is dominated by agriculture and is an absolute ceiling. If in the target year 2010, the temperatures in several countries would be above average - these countries may exceed their ceiling. Is that fair? or should based on the methodology for e.g. NEC purposes a correction to a meteorological average year be made? Some discussion on this aspect would be useful.

p.12, l31 "although several Nature papers have stated" - please give real references and remove the journal. Also in the conclusions - the above discussion on impacts on the NEC directive and level playing field in Europe should come back even if just very briefly. If we make European rules for air pollution should Denmark than have (proportionally) more pigs than Spain just because the temperature is lower and les NH₃ is emitted?

Minor remarks introduction, (can be shorter, quite some repetition)

p2, l25 "here"should be removed

p2 l31: "source to emissions of ammonia" -change to "source of ammonia emissions"

p3 l29 remove "then"

p4 l 6-11 this has been mentioned before

methodology p5, l6: both the

p5 l14 remove : "has in this study" Note that throughout the paper there are more of this kind of not wrong but unnecessary additions - it is too time consuming to type them all here. However removing them makes the text more direct.

p6 l14 : the ... model uses not use - see earlier remark about the verbs

p13, l17 remove "of"

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p13, I31 Pouliot

Please also note the supplement to this comment:

<http://www.atmos-chem-phys-discuss.net/12/C7573/2012/acpd-12-C7573-2012-supplement.pdf>

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 23403, 2012.

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12, C7573–C7577, 2012

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