

## ***Interactive comment on “Manure nitrogen production and application in cropland and rangeland during 1860–2014: A 5-minute gridded global data set for Earth system modeling” by Bowen Zhang et al.***

**Anonymous Referee #1**

Received and published: 17 May 2017

Dear authors

The manuscript "Manure nitrogen production and application in cropland and rangeland during 1860–2014: A 5-minute gridded global data set for Earth system modeling" could be interesting for the broader communities including earth system modeling, climate scientist, and so on. Authors tried to make dataset for global manure inputs and their compositions i.e., cow, chicken, and the other animals manures. I agree this information is quite important information to assess historical global N cycling espe-

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cially stimulated by anthropogenic activities. The quality of manures (i.e., CN ratio) are quite different among the animals and must affect global N cycling in environment. So, I think this paper and dataset is worth to publish in this journal. However, some important information is still lacking in this manuscript. So, I cannot recommend acceptance for the current manuscript.

### **Major comments**

I don't have any strong objection for this data processing and the products. I think there are no perfect way to make such dataset. However, some important information are insufficient for methodology and results. For example, we can hardly follow the values used in this study. So, a substantial revision is needed to make this manuscript suitable for publication.

Another concerns are as follow;

**this is optional. not review comments** If you have already made "Carbon input" in manure application, could you share this dataset. This is also important information in GHG budget and nutrient cycling of cropland (and pasture).

### **Individual comments**

**L97–99** Before this sentence, please add the detail explanation for GLIMS. For example; "what kind of dataset?", "how to make?", "What is the original dataset?".

**L97–99** Please add the citation for GLIMS.

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- L108–111** The cited webpage said "Please mention the GLW version number with your citation.". Please clarify the version of dataset used in this study.
- L113** "global" → "national"?
- L117–118** For each livestock?
- L122–123** Are these values same among regions and periods?
- L125** Please clarify what kind of dataset are used in Holland et al. (2005) (N production? population?). Also, please add short description of this dataset.
- L130** How to deal missing data in FAOSTAT. Are there no missing data for total heads?
- L130–133** Before the this calculation, were GLIMS dataset (gridded data) aggregated to country based values?
- L130–133** What is the GLIMS's reference year (2005) in your study?
- L133** Is  $k$  1960–2014?
- L134** Please add the citation for IPCC 2006 guidelines.
- L136–142** A little bit tricky. Are there any information for country specific values of  $Nrate_{i,j}$  (and  $TAM_{i,j}$  in IPCC 2006 guidelines. So, please clarify "i" to be just China, US and the others.
- L136–142** Please clarify the values in  $Nrate_{i,j}$  and  $TAM_{i,j}$  used in this study, to show the differences among countries.
- L152–153** How to define the different agro-ecological areas.
- Eq.4, L154–168** Could you show all values used in this study? (if possible, as a table)

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- L366–388** This sentence is not needed in the conclusion of this study.
- L175–179** Please show the values used in this study for each  $F_M(j, \dots)$ .
- L175–179** Are there any reasons (or premises or citations) to use your assumed values? For example, you applied different values among different farming systems. Why? Also, I wonder why same values are applied throughout entire period (1860–2014?).
- L193–194** How about rangeland?
- L199–202** How to identify smallholder (or industry) in each grid? Please explain in detail.
- L237–244** I think the linear trend of manure production (i.e.,  $\text{kg N km}^{-2} \text{ yr}^{-1}$ ) is doubtful for this long time (1860–2014). This analysis should be separated to short periods (e.g., 1860–1910, 1910–1960, 1960–2010).
- L246–248** Please show the time-series data for fraction of livestock categories during 1960–2014.
- L3.4** Could you write the result of comparison with the other map (Fig./,8) in this section?
- L286** Why "±"?
- L301** Please specify → "during the past six decades"
- L304–312** These sentences are appropriate for Introduction. Please move to Intro or remove.
- L314–321** Please clarify this statistical analysis in the material & methods. Please keep in mind "correlation does not imply causation". Of course, I agree that manure

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is important source of atmospheric N<sub>2</sub>O. Inductive approach needs more careful logic and discussion.

**L323–326** Please remove this sentence.

**L332–334** Please clarify how large variance the excretion rate are existing among regions (seasons)? Please cite previous studies for this value.

**4.3** Could you suggest the potential way how to reduce the uncertainties in this dataset?

**4.4** There seems to be no information and relevances to your dataset in this section. Please remove this or move to introduction.

**Fig 1** Honestly, from this figure, I can hardly follow data processing of this study (e.g., I cannot understand what the main dataset is and what is your data treatment). Perhaps, it is easy to understand using summary table for the dataset (i.e. data source, dataset, units, referreces).

**Fig 6** Please use "Swine" instead of "Pig".

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