

Interactive comment on “Reconstruction of spatially detailed global map of NH_4^+ and NO_3^- application in synthetic nitrogen fertilizer” by Kazuya Nishina et al.

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Dear editor Dr. Carlson

Thank you for your positive response to our manuscript (and dataset) and handing this. It is exciting (but tough for me) to make mutual open discussion between two manuscripts. We would like to response your question and comments.

How does the choice of different starting sources, FAOSTAT vs IFA, influence the subsequent processing and overall quality of the derived product?

The most important feature of this study is to estimate historical NH_4^+ and NO_3^- inputs. FAOSTAT has more detail information for n fertilizer species. So, we used FAOSTAT dataset.

From the view to the differences in the amount of N fertilizer inputs between two N fertilizer maps, we thought the choice of database is not so important. Instead of the choice, the different tactics (as you pointed out) resulted in the major difference between two.

Does the difference in tactics adopted to deal with variable completeness of country data (imputation to fill gaps in one case and focus on primarily the largest fertiliser users in the other case) induce a substantial or insubstantial difference in the outcomes of the two data production efforts.

Both sets of authors compare their products to Potter et al. 2010 and specifically for the year 2000. If each set of authors now includes the other data set in that comparison, do their overall conclusions change?

We agreed on the advantages in strategy in Lu and Tian (2016), which estimation of N fertilizer rates was based on crop type. However, there are no information about the historical crop area changes in each crop type. As described in Lu and Tian (2016), this is a potential uncertainty source to historical changes in total N fertilizer use. In addition, during the half century, N fertilizer rates in each crop type might change accompanied with economical situation and agricultural technique in each country.

Also, we thought that national policy affect the national N fertilizer consumption (e.g., subsidies for N fertilizer use) in each country. This is a reason to use national census (FAOSTAT) for the estimation of N fertilizer rates in our study.

By this mean, there are positive and negative sides in the both tactics to make N fertilizer map.

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Nevertheless (we did comparison in the revised manuscript), there are good general agreement between two ($R = 0.84$ in spatial correlation in 2000). This is very interesting.

What specific information about time histories or geographic patterns of fertiliser use do readers and users gain from the inclusion of NH_4 and NO_3 data in the one case and from the inclusion of P data in the other case?

We provide the dataset for the fraction for NH_4^+ (NO_3^-) in each country. This can be utilized also in the other N fertilizer maps.

Finally, how does each set of authors see their efforts and products as complimentary to the other effort?

Our approaches in two papers are quite different to reconstruct global N fertilizer map from existing dataset. They are almost independent each other. We think this is very important fact if we evaluate the uncertainties resulted from N fertilizer input data in global N cycling studies.

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