Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2018-377-AC3, 2018

Biogeosciences Discussions

Interactive comment on "Quantifying Global N_2O Emissions from Natural Ecosystem Soils Using Trait-Based Biogeochemistry Models" *by* Tong Yu and Qianlai Zhuang

Tong Yu and Qianlai Zhuang

yu401@purdue.edu

Received and published: 11 December 2018

1. The authors modified model nitrification process. As I know, most of soil N2O emission is from denitrification process, in which NO3- is converted to N2, N2O, and NO. Only a small part of N2O is from the nitrification process. I don't think the improvement in nitrification process could substantially improve the simulated N2O. I would suggest the authors use trait-based approach to represent denitrification as well. Response: Thank you for your suggestions. Denitrification is definitely an import process as it contributes more especially in reduced environment. In this revision, we added a paragraph about the potential effect of denitrification in Discussion section 4.3 (line 13-20,

page 17).

2. The equations in original TEM should be described. Response: Limited by the length of the manuscript, more equations focusing on N2O fluxes and other processes of N cycle can be referred to a Master thesis of Yu, T. (2016). Tong Yu (2016), Quantifying the global N2O emissions from natural ecosystems using a mechanistically-based biogeochemistry model, MS thesis, http://docs.lib.purdue.edu/dissertations/AAI10145857/

3. The authors claim the nitrification process was improved. However, nitrification rate was not validated. Response: Because direct observational data for nitrification rate is too few to allow us conduct its validation. Instead, we validated modeled N2O emissions by comparing with observed data.

4. For model sensitivity, authors examined model sensitivity to climate and soil C/N. It is correct that N2O emission is sensitive to climate change (particularly temperature). However, N2O emissions in the natural ecosystems could be very sensitive to the atmospheric N deposition. In recent years, there is a debate on how soil N2O emissions response to CO2 concentration. I would see some results about N2O sensitivity to N deposition and CO2. Response: In this revision, we conducted the sensitivity test on the effects of dry and wet N deposition on N2O emissions, and added it to Section 2.3 and 3.2.1. The average atmospheric CO2 was applied uniformly for each grid, so we did not do the sensitivity test on CO2 effects. In our future work, we will obtain spatially and temporally explicit CO2 data to drive the model to examine the CO2 effects on N2O emissions. This step will take a significant effort, which is beyond this study.

5. What is the date sources of atmospheric CO2 and nitrogen deposition? Response: In this revision, we added the data sources in Section 2.2 Data.

6. Recently, a global N2O model comparison has been initiated to run models from 1860 to 2016 (Tian et al., 2018). Ten land models were included in this project. The participating models include both natural system and cropland soils. I would suggest the authors to justify why this paper only included natural soils but ignored the more

important N fertilizer in cropland. Response: Thank you for the reference. We have carefully read this paper and added related results to Discussion on page 14.

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2018-377, 2018.