

Review of “**N<sub>2</sub>O changes from the Last Glacial Maximum to the preindustrial - part II: terrestrial N<sub>2</sub>O emissions and carbon-nitrogen cycle interactions**” by Fortunat Joos, Renato Spahni, Benjamin D. Stocker, Sebastian Lienert, Jurek Müller, Hubertus Fischer, Jochen Schmitt, I. Colin Prentice, Bette Otto-Bliesner, and Zhengyu Liu.

In the submitted manuscript – by now apparently into the third revision – Joos and co-authors investigate the changes in terrestrial N<sub>2</sub>O emissions from the last glacial maximum to preindustrial times. They describe their model setup and the model experiments performed, and describe model results, as well as results from two sensitivity experiments. The authors can explain about half of the change in terrestrial N<sub>2</sub>O emissions between LGM and preindustrial and discuss some factors that might lead to the underestimates by their model.

Overall, the manuscript is very well written, and about ready for publication. I am torn between recommending publication as is, and publication with small changes. However, the manuscript should definitely be published, as it is a pioneering effort in modelling the changes in N<sub>2</sub>O emissions from the LGM to PI. While the authors cannot yet explain the full change, this publication is required by the community as a base to build upon in improving our understanding of well-documented biospheric changes from the past to the present.

I have no major issues with the manuscript. While the previous discussion between authors and reviewers indicates that there may have been some rather strong claims in previous iterations of the paper, I can find no fault in this respect with the present version of the manuscript. Claims by the authors appear well-supported by the author’s results, and the model appears to be documented adequately. It may well be that some details of the implementation of the Nitrogen cycle in LPX-Bern leave something to be desired in the light of the most recent findings, but personally I am rather glad that there still is room for improvement, as it gives us something to build upon in the future.

However, there are two minor issues that may warrant revisiting the manuscript. Looking at the ice core reconstruction in Figure 3, it is striking that more than half of the emission change was realised in two very rapid steps. The model reproduces these step-like changes, although it underestimates the magnitude and the rapidity of these step-changes, as discussed in the manuscript. Later on in the Holocene, however, a further quarter of the reconstructed emission change was realised as a slow upward trend in N<sub>2</sub>O emission, but the model completely fails to reproduce this upwards trend, it rather shows nearly constant emissions. I may have overlooked it, but so far I am missing a discussion of this feature.

A second issue is that I find some of the Figures slightly confusing, but I appreciate that this may be a matter of personal taste. In Figures 4-6, 8, and 9 I was irritated by the fact that I needed to read the Figure caption very carefully in order to understand what was shown. I was expecting to see a Figure title, indication Figure content, and overlooked the units and quantity shown next to the colour bar – obviously my mistake, but maybe the authors can find a way to make this slightly clearer.