

Interactive comment on “Global Gridded Crop Model evaluation: benchmarking, skills, deficiencies and implications” by Christoph Müller et al.

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We thank the reviewers for their feedback. Our responses are inserted below, following their original comments.

Reviewer 1: This is a well written paper. It proposes a framework to assess the performance of global gridded crop model. The framework will be a valuable asset for the research community. I think this paper has been submitted in a rush and I have some moderate concerns.

Response: We thank the reviewer for the positive evaluation. We are sorry that we made the impression of having submitted the paper in a rush, which clearly was not

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the case. Please find responses to your individual points below.

1) The authors claim that they will provide an online tool. It is a great idea but I wonder why not bring the evaluation system online before submitting the paper.

Response: The online evaluation tool is not the objective of the paper but an additional service to the modeling community. With the final publication of the paper, we'll make the online tool publicly available so that we can refer to this paper on the webpage. However, we now have included the URL of the tool (<https://mygeohub.org/tools/ggcmevaluation>), where access is currently restricted to the developers.

2) The paper cites some papers in preparation or under review which make it hard to refer to these papers.

Response: We assumed that these papers would have progressed sufficiently during the time our manuscript was under review. We will remove the references to Ruane et al. in prep. (which still is in prep) and update the references to Folberth et al. in prep. and to Prowollik et al. under review.

3) There are too many figures and tables (with 45 figures in the supplemental file). And there are over 10 lines in some figures (Figure 1-4) that make the figures very busy. It is better to extract the key information and limit the number of figures if possible.

Response: We agree that there are many figures and also a lot of information in the paper. This is why we have moved the majority of these into the supplement. The aim is to have sufficient information in the main document to convey the main message and to supply additional information for specific interests in the supplement. We cover the evaluation of 14 GGCMs for up to 4 crops each and establish a benchmark set for further model evaluation and future improvements with comparisons to reference data at three different aggregation levels. Therefore, also the extent of the study is very broad. We understand that it is the idea of GMD to supply all the space that is needed

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to describe model evaluation in sufficient detail and don't feel that the content of our study is not concise enough. Also, to allow for individual model evaluation, we think that it is essential to show all individual models in one figure (as e.g. in figures 1-4), even though these are then busy.

Specific comments Line 169: What interpolation methods were used to disaggregate the daily data to sub-daily?

Response: ORCHIDEE-crop used an internal weather generator for the interpolation to sub-daily values, whereas CLM-crop created a 6-hourly weather input data set based on AgMERRA and the 6-hourly CRU NCEP data (Wei et al., 2014). This will now be explained in more detail in the supplement.

Line 177: The resolution of supplied input and harmonization data is 0.5 degree. The spatial scale of CLM-Crop, EPIC-IIASA and PRYSBT2 are 1 degree, 5 second and 1.125 degree. What is the method used to re-grid those data to 0.5 degree?

Response: CLM-crop used the model-internal re-gridding routine as described in the CLM 4.5 Technical Note (Oleson et al., 2013), PRYSBI2 simply averaged over all 0.5 grid cells within the 1.125 degree cells and EPIC-BOKU (not listed as 5 arc minute resolution in table S2, will be corrected) and EPIC-IIASA used the same climate and management input for all 5 arc minute cells (up to 36) within one single 0.5 degree grid cell. Thanks for pointing out that this is not described in sufficient detail and we will supply this information in the supplement and in Table S2.

Line 180: "soy". However, in other place, the word is "soybean".

Response: Will be changed to "soybean"

Line 215: delete the colon

Response: Will do.

Reviewer 2: The development and evaluation of the global gridded crop models is a

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critical step in being able to provide an evaluation of the potential impacts of climate change on future global production. the authors have done a good job in explaining the process and the shortcomings in different models and approaches. This effort will set the stage for the next generation of improvements in crop models at all scales.

Response: Thank you.

References

Oleson, K. W., Lawrence, D. M., Bonan, G. B., Drewniak, B., Huang, M., Koven, C. D., Levis, S., Li, F., Riley, W. J., Subin, Z. M., Swenson, S. C., Thornton, P. E., Bozbiyik, A., Fisher, R., Heald, C. L., Kluzek, E., Lamarque, J.-F., Lawrence, P. J., Leung, L. R., Lipscomb, W., Muszala, S., Ricciuto, D. M., Sacks, W., Sun, Y., Tang, J., and Yang, Z.-L.: Technical Description of version 4.5 of the Community Land Model (CLM), NCAR Earth System Laboratory Climate and Global Dynamics Division, Boulder, CO, USANCAR/TN-503+STR, 2013.

Wei, Y., Liu, S., Huntzinger, D. N., Michalak, A. M., Viovy, N., Post, W. M., Schwalm, C. R., Schaefer, K., Jacobson, A. R., Lu, C., Tian, H., Ricciuto, D. M., Cook, R. B., Mao, J., and Shi, X.: The North American Carbon Program Multi-scale Synthesis and Terrestrial Model Intercomparison Project – Part 2: Environmental driver data, *Geosci. Model Dev.*, 7, 2875-2893, 2014.

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