

Interactive comment on “Using the anomaly forcing Community Land Model (CLM 4.5) for crop yield projections” by Yaqiong Lu and Xianyu Yang

Anonymous Referee #1

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This manuscript presented the first evaluation of the anomaly forcing mode for crop yield simulation with CLM4.5 in CESM. The authors created anomaly forcing datasets for three climate scenarios (1.5 °C warming, 2.0 °C warming, and RCP4.5) and conduct global CLM crop simulations using the compset of CLM45BGCCROP at a spatial resolution of 1.9 by 2.5 degrees. The authors found that the anomaly forcing CLM could not produce crop yields identical to the standard CLM with subdaily forcing, but captured the relative changes between scenarios and over time, as well as regional crop yield variations.

Overall, this manuscript is neat. It fits the “model evaluation” category of GMD and should be very interesting to the broader community. It is well written and organized. I only have the following minor concerns for the authors to consider.

C1

it is not very clear to me how the authors calculated the “forcing variance R2” as shown in Fig. 1. The definition in the caption is unclear. Does “every ten year-averaged monthly variance” represent variance of very ten-year-averaged monthly forcing or I should interpret it by the wolds themselves? It would be good to also note the sample number for it, which would help the understanding.

I suggest the authors give more details on how to calculate the averaged yield across different crop species and regions for a specific country/region as shown in Fig. 4 and other maps. Is it simple area-weighted average?

L165: could you elaborate why the computational cost is high when using transient CO2 and nitrogen fertilization? Is the higher computation cost from the “transient CO2 and nitrogen fertilization” simulation itself (compared with constant CO2 and fertilization cases) or just more experiments?

L252-L253: what’s the consideration for not masking the insignificant differences here?

In the discussion part, the authors discussed the potential causes for some exceptions, which is good. However, I suggest the authors give some example figures for those exceptional data, either in the main manuscript or in the supplementary materials. It would help strength the statements in this part.

Figure 4 is not referred in the manuscript at all.

L340-L341: “is due are due”->“are due”

It would be good to give some implications for CLM5.0 too in the final discussion part. For example, whether there is any changes of the anomaly forcing mode in CESM2.0 and whether the results for CLM4.5 still holds for CLM5.0. That would be also helpful.

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