



EGUsphere, referee comment RC1
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Comment on egusphere-2022-623

Anonymous Referee #1

Referee comment on "Opening Pandora's box: reducing global circulation model uncertainty in Australian simulations of the carbon cycle" by Lina Teckentrup et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-623-RC1>, 2022

Any bias in climate forcing directly influences the model projection of carbon cycle dynamics. Teckentrup et al. quantify the impacts of different bias correction (including univariate correction, multivariate correction, model averages, and random forest method) methods on improving the outputs of carbon stock changes from a dynamic global vegetation model (LPJ-GUESS). This draft was well-written, but I still have some comments on the algorithms used in this analysis, and I think the novelty is insufficient for a paper in ESD.

Major comments:

- The biggest concern is that after reading I still have no idea which bias correction method should be used to assess the spatial variability or short-term and long-term temporal variation in the total carbon stocks. The results are quite confusing. It would be good to evaluate the classifications of correction methods by function
- The authors should perform a synthetic analysis and evaluation. The current results are very preliminary.

Specific comments:

Fig 1: It would be good to differentiate steps and the name of methods in each step. Can use different icons or colors.

Table 2: Some of these selected metrics reflect the same (similar) property. For example, all the Root mean squared error, Normalised Mean Error, and Mean bias error indicates the bias in mean value. So the model with good skill in simulating mean value tends to have a higher rank. It is unfair.

Ln148: Why use the correlation of 0.3 as a threshold to select the models?

Ln305-314: Please clarify which meteorological forcing influence the mean value of C_total, the short-term variability (i.e., inter-annual variability) in C_total, and the long-term variability in C-total.

Ln320: In Fig3, only squares and circles indicate a larger bias in mean PPT after multivariate bias correction. Why?

Ln350: The authors should give a summarized metric showing which bias correction method is better. It is difficult to find the best model by eyes.

The spatial patterns of bias and CV of C_{total} simulated by the model in Fig 5 and Fig 6 have a clear and strange strip with extreme values. This is not reasonable. Could you please explain why this strip exists?

Ln374-375: It is not clear why C4 grasses would have a higher CV. The authors did not convince me that this is the real reason.

Ln379-380: The authors did not explain why the bias in C_{total} relates to foliar projective cover/ Could you please show the relation between C_{total} and foliar projective cover? Which factors or processes can influence foliar projective cover in the LPJ-GUESS model?

Ln415-417: The peak of seasonal GPP was underestimated a lot. Is this because the peak of meteorological variables (like precipitation or temperature) was underestimated and uncorrected?

Ln421-422: The bias in the dry season seems very small. So the effects of correcting data in the dry season may not be very useful?

Ln442-445 The introduction of the importance of Australia for the estimation of global land carbon sink should not be in the Discussion. Can put it into the Introduction.

Ln469-470: Don't repeat the results of the analysis in the Discussion.