Geoscientific

Model Development

Discussions

Open Access

[GMDD]

Interactive

comment

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 #2

Received and published: 2 December 2020

General comments

The authors demonstrate the impact of using anomaly forcing in the Community Land Model 4.5 on crop yield projections, as compared to using 3-hourly forcing data, for three scenarios: 1.5 °C warming, 2.0 °C warming, and RCP4.5. This is an important and timely piece of work, given that high resolution output data is not always easily available from climate models for use in driving crop components of land-surface models.

The paper is well written and includes all relevant information for reproducing the key results. I have a few specific comments below to be addressed before publication.

Specific comments

Line 28 "Our approach can be adopted by other land surface models to expand their capabilities for utilizing monthly climate data" Could you elaborate on this by adding a paragraph to the discussions section to discuss the applicability of this method and these results to other models?

Line 59: "biogeochemical compset is active" is jargon specific to CLM – could you replace with a more general phrase? (or add a sentence to explain what a "compset" is)

Line 59: could you indicate what "CLM-CN" and "CLM-BGC" include? (can be very brief e.g. what the "CN" and "BGC" stand for)

Line 74: add references for CRUNCEP, QIAN

Line 96: The phrase "has been in function" is not clear, so should be reworded. E.g. could replace with "has been functional" or "has been available".

Table 1: Define abbreviations CAM and MOAR.

Line 141: Change "multiplies" to "multiplied by"

Line 149: Change "equation2" to "equation 2"

Line 153-155: Need to explicitly define the quantities used in these equations. Also, are the underscores intentional, or should they be subscripts instead? Consider whether the notation for each variable could be simplified (e.g. is it necessary to include the letters "var", or is this implicit?).

Replace all occurrences of "CO2" with "CO_2" e.g. lines 164, 166.

Line 180: replace "R2" with "R^2".

Line 189: replace "as" with "to"

Line 194: explain "bottom atmosphere temperatures". Is this the air temperature of the lowest atmospheric level simulated by CESM? What height or pressure level is this?

Interactive comment

Line 205-6: "we set the maximum precipitation anomaly ratio to 5 to avoid unrealistically extreme precipitation levels". Can you add an explanation of why is this necessary i.e. what are causing these extreme precipitation levels, with references.

Figure 2 caption: Change "1pt5, 2pt0" to "1.5 °C, 2.0 °C"

Line 237-9: "For irrigated crops, such overestimations in the northern US and Europe disappear (Figure 3g-i) because sufficient irrigation was added to the irrigated soil column; as long as there is plant water stress which removed water availability impacts on crop yields." Can you clarify this sentence, since at the moment it seems counter-intuitive (did you mean something like: "because sufficient irrigation was added to the irrigated soil column to prevent plant water stress, which removed water availability impacts on crop yields"?).

Fig 3 caption: "the historical crop map in 2005". Can you add the reference?

Lines 267-272: Is this the first time these "standard CLM" yield projections have been published? If yes, could you add a discussion, including a comparison to other yield projections in the literature for these scenarios. If not, could you add references.

Line 368: give reference for UN FAO yields

———————————————————