

Interactive comment on “Sources of interannual yield variability in JULES-crop and implications for forcing with seasonal weather forecasts” by K. Williams and P. Falloon

Anonymous Referee #1

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This manuscript evaluates the impact from reduced meteorological forcing and/or initialization data on crop yields with the JULES-Crop model. The goal is to identify the input variables responsible for interannual yield variability in order to find the minimum required data needed to run the model over seasonal timescales. Sub-daily, daily, and daily climatology inputs are compared, and techniques for initialization are also explored. Overall, the methodology can simplify the setup and data needed to run the model, making JULES a useful tool for seasonal crop forecasts. The paper is well written and concise, however the manuscript could benefit from some clarifications and the study should include additional analysis.

I understand the ease of comparisons between the model runs with the control, but
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there was no attempt to validate the model against observational data. Only once did the manuscript mention that the control run (as performed in another study) correlated well with observations, but correlation with a control run doesn't mean the reduced model correlates well with observations. I would like a stronger attempt to validate against observations; without it, seasonal forecasts by the model won't be very useful.

I think the analysis of model runs could be expanded. Using a Pearson Correlation alone is not sufficient to conclude the model is robust enough to run with coarser input data. What is the slope of the relationship between yields from the control and reduced input models? What happens during the growing season – are the growing phases and plant development correlated? How well does the reduced model perform during years with low crop yields? High crop yields? It is important to understand the outliers as well as the mean. The reduced input model must be able to capture the extremes and not just the mean.

The correlation between the various model runs is quite high; with the exception of precipitation, the model does not seem to have much sensitivity to the input data. Is it possible this could be the result of overtuning of model parameters?

General Comments:

1. The model description seems sufficient for the context of this paper, however the only reference to the original model description in section 2 is a footnote. This should be moved into the text.
2. The authors mention at least three versions of JULES (4.0, 4.1, and JULES-crop). Please state which version is used in this manuscript (and be consistent when referencing the model).
3. In section 3.3, what is a dump file? It would be clearer if the authors stated the initialization came from the end of the control spin up rather than the beginning of the control main run.

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4. In section 3.4, what data was used to construct the daily climatologies?
5. How were the sens-* runs initialized – was it similar to the disag run using the “beginning of the control main run”?
6. The authors state in section 3.4 that the spinup “was particularly important for the sens-T run,” but no explanation is given. In fact, the sens-T run isn’t mentioned again in the paper, with the exception of one footnote, even though it has the worst correlation with the control run than any other sens-* run. I think this simulation deserves an explanation.
7. It would be interesting to know which variables are included in the initialization with climatology, or if the list is too long to include, perhaps those that the model shows the most sensitivity.
8. Section 4 only include maize results, noting that the other crop types showed similar conclusions. However, it might be useful to include the other crop results, perhaps in Table 2 for comparison, or as supplementary material.

Technical Notes:

1. There are several footnotes in this manuscript, which are discouraged by GMD. I think all of the footnotes can be incorporated into the manuscript.
2. Page 4605, Line 7: please spell out “respectively”
3. Page 4606, Line 9: the authors state the run was from 1960-2009, but on line 7, stated the CRU-NCEPv4 was extended to include 2012. Did the model run go to 2012?
4. Page 4606, Line 21: “Each run” implies there was more than one run; I assume there was only one irrigated run.
5. Figure 2: the caption states the comparisons are with the control run, but the section 4 comparisons refer to the disag run.

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