Geoscientific
Model Development
Discussions

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# *Interactive comment on* "The Global Gridded Crop Model intercomparison: data and modeling protocols for Phase 1 (v1.0)" *by* J. Elliott et al.

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General Comments:

The authors discuss the protocols established for the Agricultural Model Intercomparison and Improvement Project, specifically for the Global Gridded Crop Model Intercomparison. The paper addresses the types of experiments to be conducted for each participating modeling group, with a description the atmospheric forcing and other input data for model harmonization, and an overview of the methods for evaluating performance.

The paper is well written and addresses a growing need for a comparison among the increasing number of agricultural models. I believe the methodology is sound, with well

established guidelines, but the manuscript would benefit from a few clarifications.

One example is with the setup of the default model configuration – does that include the atmospheric forcing from the protocols or the standard forcing data normally used for each model? The paper alludes to using the protocol forcing data, but doesn't explicitly state how it should be configured.

I'm not sure I see the benefit of growing crops everywhere. While this may provide some useful incite to possible future land use scenarios and yield expectations, there is no means of validating any of the models and therefore comparing the productivity between models isn't very useful. The authors mention data won't be considered in regions where crop growing season is considered unreasonable; therefore it might make more sense to only consider where crops are currently grown.

Specific Comments:

1. P. 4388, L. 6-8: Do the three (or more) models used for intercomparison need to be comparable models? I think a DGVM and an empirical model will respond differently, especially to the harmonized forcing. Comparing the simulated yield might not reveal any useful information if the processes that go into determining that yield are represented completely differently. This brings up another issue – how are the site models run, globally or will site based output be aggregated to global levels?

2. P. 4388, L. 16: I can understand running the model without nitrogen stress to compare with models that don't consider nitrogen, however, one concern is in some models, the carbon and nitrogen are coupled and removing the nitrogen stress can cause a decoupling of the carbon-nitrogen system, which might lead to less than desirable model behavior.

3. P. 4389 L. 24: The word "minimum" used here and later on P. 4390, L. 6 should be replaced with "standard" since it seems that there are exceptions to the required simulations depending on model capabilities.

4. Sect. 3.1: This section is not very clear. Are all the datasets daily or are some monthly? What about models that require a higher temporal resolution? How should models that require long spinup periods begin the simulation – cycle through the generic pre-industrial atmospheric forcing (for hundreds of years) before using the Princeton data or can an initial conditions file be used from a previous simulation? What period are you using for the analysis – just the period that all datasets cover, or the entire period for each individual dataset?

5. P. 4393, L. 2: Using maturity dates to harmonize harvest is tricky since some models use a GDD based approach to determine maturity (and growth phases of crops). Depending on atmospheric inputs of a given year, the maturity dates could differ greatly between the model and the dataset. Do you have a suggested approach for those models?

6. P. 4393, L. 8-9: It would be nice to have a brief description of the rule-based approach used to estimate planting and harvest dates when data isn't available.

7. Sec. 3.2.1: Would it be possible to put a flag in the dataset to indicate which data source is being used for the planting date for each crop? It might give a confidence or quality level for the data.

8. P. 4397, L. 18-23: What is the reasoning for applying fertilizer in regions that are not currently applying fertilizer? Even if it's for currently uncultivated lands, the way it is described, that methodology is counter to the current fertilization practices.

9. Table 2: What is the "# models" column – is that the expected number of models that will be contributing (does that include different model versions)?

10. Table 8: Both Planting Window and Automatic Planting are listed for the harmonized runs, but the dataset includes just one plant date – how should this be used, perhaps clarify in Section 3.2.2?

11. Table 8: The irrigation protocol isn't mentioned in the paper (assuming each model

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uses its own), but in Table 8 an automatic irrigation protocol is included. The authors should include a paragraph explaining how this should be implemented in the harmonized runs.

12. Table 10: My understanding is that in the WFDEI dataset, pr does not contain snow, it must be added to prsn.

13. Fig. 7: Will the authors make three figures, one for each run – default, fullharm, and harmnon, or have a means of knowing which run was considered "best".

Technical:

1. P. 4393, L. 9: should be Waha et al., 2012.

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