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Discussions

EGU

Interactive comment on "Climate data induced uncertainties in simulated carbon fluxes under corn and soybean systems" *by* Varaprasad Bandaru

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It is regrettable that no sensitivity analyses of the modelled NEE to climate data is done. The paper is meant to analyse the uncertainty of model outputs to climate data and a prior sensitivity analyses of the simulated NEE to changes in temperature, short wave radiation, precipitation, etc. separately would have helped in the discussion and would have allowed solid conclusions.

Response: Thank you for your suggestion which helped me to explore various sensitivity analysis methods. I conducted global sensitivity analysis using extended fourier amplitude sensitivity test (EFAST) method to determine total and first order sensitivity

indices for various climate variables. As shown in the attached figure, dominant climate variables contributing to the variation in the NEE estimates vary with irrigation management irrespective of the crop. Under non-irrigation management, precipitation had the highest total sensitivity index with average value of 0.62 (averaged over crop and years), followed by maximum temperature and minimum temperature with average values of 0.39 and 0.28, respectively. In contrast, precipitation was shown to be not a dominant factor influencing NEE under irrigation management, and maximum and minimum temperature variables were the most influential factors with average total sensitivity values of 0.78 and 0.63 (averaged over crop and years), respectively. On average, precipitation had the total sensitivity index value of 0.19.

I find it also a bit confusing to try to explain the effects of relative humidity as a variable since it is a combination of temperature and water content in the atmosphere. I would suggest considering the partial pressure of water vapour instead (or showing both to try to decorrelate with temperature) even though models require relative humidity as entry variable.

Response: As per the reviewer's suggestion, vapor pressure deficit was included in the place of relative humidity.

It would be useful to have a figure showing the variability of the studied variables with time (Temperature, shortwave radiation, precipitation) especially since you are considering a percentage error which would normally be higher for smaller values.

Response: Point is well accepted. Figure showing average daily growing season values of weather variables (averaged over sites and years) was included (please find attached figure). This figure provides variability over the growing season.

Lines 458-459 I don't quiet understand the reference to litter decomposition. This may be relevant for forests or for agricultural systems where litter is left on the fields but maybe not so much for corn and soybean crops.

Response: Here litter means residue left on the soil after harvesting. EPIC has 5 carbon pools including metabolic litter, structural litter, microbial biomass, slow humus, and passive humus compartments (Izaurralde et al., 2016). I revised the text to clarify this.

Izaurralde, R.C., Williams, J.R., McGill, W.B., Rosenberg, N.J., Jakas, M.C.Q., 2006. Simulating soil C dynamics with EPIC: model description and testing against long-term data. Ecological Modelling 192, 362–384.

In the discussion and conclusion I am missing some discussion relative to the model used (which could link back to the sensitivity analysis). Your results are particularly linked to EPIC and conclusions could be different with another model that would have responded differently to climate variables.

Response: As earlier mentioned, sensitivity analysis was performed and revised the text in all sections.

Figures 2 and 5 are not very easy to read, I would suggest adding colors to be able to distinguish different datasets.

Response: As per reviewer suggestion, color figures were generated.

Figure 1 is not referenced in the paper, all references to figures are shifted by one.

Response: Revised the text and corrected numbering of the figures.

Figure 3 and Table 3 are slightly repetitive, I would suggest merging the two in one figure or one table.

Response: In the initial review, the associate editor suggested to add the table in addition to figure 3. For that reason, we have included the table.

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2020-129, 2020.

a) Main sensitivity indices
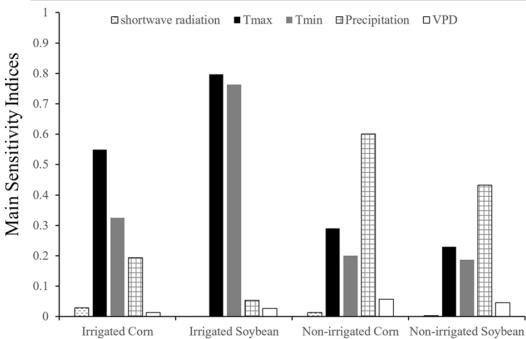
b) Total sensitivity indices
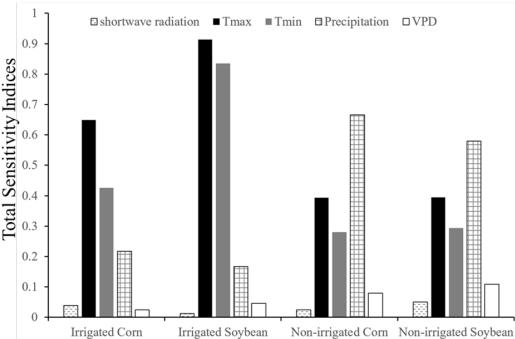
Figure 4. Main sensitivity indices (a) and total sensitivity indices (b) estimated with the EFAST method (N=1500) for the net ecosystem exchange (NEE). The vertical bars show the average sensitivity indices (averaged over years) calculated for the 5 climate variables.

Fig. 1.
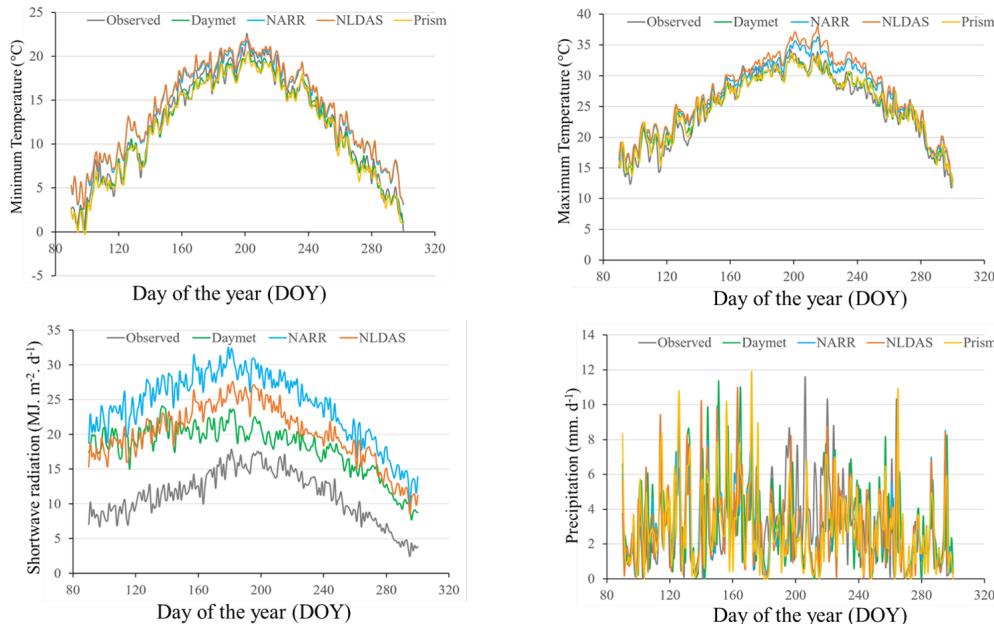
Fig.S1. Comparison of average values (averaged over year and sites) of weather variables over the growing season (April–October) from gridded climate datasets with measured weather at flux tower sites.

Fig. 2.