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Hydrology and Earth System Sciences Discussions

Interactive comment on "Modelling irrigated maize with a combination of coupled-model simulation and ensemble forecasting, in the west of China" *by* Y. Li et al.

Anonymous Referee #3

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This papers presents results from modelling irrigated maize in W-China taking into account uncertainty in WOFOST model parameters using an ensemble technique and applying the results for simulating scenarios for grain maize irrigation.

I think the paper presents some interesting and original results, however major revisions are necessary before it can be published for several reasons:

1) The title and general introduction of the paper do not cover the results that are actually presented. The title states "ensemble forecasting" but actually nothing is forecasted. I would rather call this a scenario study taking into account model uncertainty.

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Moreover, stating "ensemble forecasting" will lead many people to think that this paper deals with ensemble forecasts made by numerical weather prediction models (whether pertinent or not), but this is not the case.

2) The paper strongly focuses on "model coupling" however I do not really see what is so special about this aspect. The default WOFOST model has a 1D soil water balance which has the same purpose as HYDRUS 1D, albeit not as sophisticated. So part of the work is mainly exchanging the default water balance with HYDRUS1D, this is justified given the objectives but not particularly exciting.

3) I have some questions about the interpretation of the results of the sensitivity analysis. The results demonstrate that the the HYDRUS parameters are among the parameters which have a strong impact on WOFOST simulated biomass results. If we now look at the setup of the field trial, then is it described that the maize crop recieved 9 times 100mm of irrigation. Given a growing season length of $\sim$150 days, this means that the maize crop could transpire roughly 6mm/day. WOFOST simulations for a somewhat comparable semi-arid climate (south of spain) demonstrate that a maize on average needs around 600mm of water with a growing season length of 120 days (5mm/day). So basically the crop has plenty of water available to grow, in such cases you do not expect the soil water balance parameters to have so much influence. Unless you push them to extreme values. Also if we look at figure 4, it is unlikely that the crop will experience water stress given that soil moisture is always above 0.3 for the whole soil column.

Some detailed comments:

p3844: The discussion of model uncertainty here is a bit out of scope of the rest of the paper.

p3847-L25: this is incorrect, in WOFOST leaf growth is always the result of leave biomass time specific leaf area and not a function of temperature.

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P3849: How is the pressure head (h) defined? is this an average over the rooted zone, or calculated per compartment?

P3850: Where does LAI come from in equation 5, I assume it is modelled by WOFOST?

P3850-L20: Why only three layers. To my knowledge the Richardson equation can only be solved numerically when the lyer thickness is small (in order of a few centimeters). Why choose such thick soil compartments, or does the HYDRUS1D internally use smaller layers for numerical calculation?

P3851-L10: Again the Richardson equation in the HYDRUS model cannot be solved at daily timesteps, so I assume internally a smaller time-step is used?

P3852-L1: crop height is not a WOFOST output variable, please specify how you derived it.

P3852-L15: The Boons-Prins reference actually quotes multiple sets of parameters for different parts of Europe. Please tabulate the one you used for your study

P3853: It is actually not clear to me if the results presented in figure 5 and 6 have been obtained by only calibrating the soil water balance? Or has there been some calibration on the observed time-series of LAI, WSO and TAGB as well.

P3854: It is not very clear how the ranges for the WOFOST model parameters were derived. Were these taken from the ranges specified by the parameter database in the WOFOST model installer?

P3855: What is decribed here is a scenario analysis taking into account the model uncertainty. It has nothing to do with forecasting.

P3856-L18: I would rather say here that water limitation becomes the major yield determining factor, which is logical.

Table 4: The problem here is that the TAGP does not equal the sum of WLV, WST and

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WSO. This is because you tabulate the weight of the living plant material instead of the total weight (living + dead). Please use the total weight stems, total weight storage organs, total weight leaves here.

Table 5: You list here both the parameter AMAXTB as well as the individual X-Y pairs AMAXTB1, AMAXTB2, etc. How did you make the sensitivity analysis on the AMAXTB table parameter? Shifting individual XY pairs is not a good solution from my point of view because it may lead to unrealistic shapes of the AMAX curve with development stage. This remark also applies to the SLATB parameter.

Table 6: this table should be reformatted because it is not clear that the first column continues in the 4th column.

figure 4: change the observations into point instead of connected lines.

Figure 5: why are some of the observations connected with lines while others are not.

Figure 6: The X-axes title should read "day since 1 of January" not date. This applies to other figures as well.

figure 7: it is difficult to judge from this figure how well observed and simulated actual evapotranspiration match.

Figure 9: Please align the x-axes here for all figures: currently we see the same histogram with a varying x-axis.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 3841, 2011.