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Hydrology and Earth System Sciences Discussions

Interactive comment on "Simulation of the soil water balance of wheat using daily weather forecast messages to estimate the reference evapotranspiration" *by* J. Cai et al.

J. Cai et al.

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The reviewer made opportune comments that require proper replies and a few improvements in the manuscript. Replies are given below and are numbered for easier identification. Text changes will be performed when all reviewers and editor comments will become available.

The paper is of great interest for the readers of Hydrology and Earth System Sciences, not existing preceding in the main substance of the paper: use of daily weather forecast messages as model input. The focus could be applied in another irrigation region, notably broad discussion is presented about the results in terms of model calibration and validation, and model predictions when ETo is estimated from weather forecast

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messages. The results and conclusions obtained are consistent with the objectives. Application of weather forecast messages should be implemented with farmers advising service. In many regions of the world there are not agrometeorological stations (local stations). The proposed methodology could apply to a farmer advising service with low cost, thus improving the efficiency of irrigation in these regions. The paper should be published but it needs a revision of something details. I suggest specific comments that could be considered before the publication.

Reply: This comment is very positive and very different of that from referee 2. It really encourages to appropriately further revise the paper for clearness and assumes that the approaches used are appropriate.

Specific

1) Page 704, line 27-28. The actual crop ET is computed using the single crop coefficient approach (Allen et al., 1998) as a function of the available soil water when it is below the non-stress threshold. What is the influence of non-stress threshold?

Reply: As described by Liu et al. (1998), the maximum available soil water in the root zone is R_{max}= TAW, with

TAW=1000(Θ_{FC}-Θ_{WP}) Z_r

where TAW is the total available soil water (mm), Θ_{FC} is the soil water content at field capacity (m^3/m^3),Θ_{WP} is the soil water content at the wilting point (m^3/m^3), and Z_r is the root zone depth (m).

The soil water threshold for non-stress corresponds to the minimum available soil water in the root zone that permits crop evapotranspiration without causing crop water stress, i.e. when the soil water extracted by the crop and soil evaporation does not exceed the soil water depletion fraction for no stress p (non dimensional). The available soil water is then R_P = RAW, with

RAW=pTAW=p1000(Θ_{FC}-Θ_{WP}) Z_r

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where RAW is the readily available soil water (mm). When the available water R 8805; R_p, the actual crop evapotranspiration is equal to the maximum evapotranspiration ET_m (mm):

$ET_m = K_c \times ET_o$

where K_c is the crop coefficient and ET_o is the reference evapotranspiration (mm). Then, between two irrigation events, R varies linearly with the time t as

$R(t) = R_o+(W_{in}-ET_m)t$

where R_o is the initial value of R in the considered time period and W_{in} is the water input to the root zone storage (mm) due to precipitation and capillary rise. A daily time step computation is used. When $R < R_p$ the water available in the soil is insufficient to keep that maximum crop evapotranspiration and the actual evapotranspiration $ET_a < ET_m$. It is assumed that ET_a decreases with the available soil water R as:

$ET_a = (ET_m / R_p)R$

with R decreasing non-linearly with the time.

$R(t)= W_{in} / \alpha (R_o - (W_{in} / \alpha)) e^{-alpha\ t}$

where $\alpha = ET_m / R_p$. Further information is provided by Teixeira and Pereira (1992); and Liu et al. (1998).

This explanation will be introduced in the manuscript following the requests by both referees.

2) Page 706-707. Maybe the equations of statistical indicators used are not necessary to include them, since it refers to where they are published. Include the indicators used and their relationship with the goodness of the results.

Reply: Considering the comments by referee2, it is likely that other readers will find the need to understand better the statistical meaning of the indicators used, therefore it is

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advisable to keep the equations in the text.

3) Page 707, line 5. Change 18216;0; 1.0.

Reply: printing error to be changed

4) Page 709, line 5. You mention treatments W2 and W3; (Correct W4), but you do not mention T3 and T4, in relation about figure 4.

Reply: The mistake relative to mention W3 instead of W4 will be corrected, and treatments T3 and T4 will be mentioned in the paragraph relative to validation results.

5) Tables and figures Fig. 1b. Precipitation and ETo Units?.

Reply: Yes, units are missing in Fig. 1b because an error occurred when uploading that figure, which we did not notice at that occasion. The original figures have full information on ET and precipitation. The figure will be corrected. In addition, all figures will be improved.

6) The period of study is 2005-2007, but you use 1995-2005, Why? Have you got data?

Reply: Fig. 1 intends to provide information on the common climate in the area while Fig.2 provides for the climate during the experimental period. The text will be modified for clearness on this matter.

7) Fig 2a and 2b. Suggest put the same precipitation scale in two figures. Change in figure 2a.

Reply: The figure will be modified as suggested

8) Fig 5 and 7. You can delete them and the relatives8216; sentences about it. The information is in Tables 5 and 6.

Reply: It is true that b and R^2 are given in those Tables but it is also important to show for more interested readers how points distribute around the regression line

9) Table 1. Particle density or Bulk density?

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Reply: Bulk density. The table will be corrected

10) Table 2. Treatment W3 / Mid-season stage / 2005-06. There is an error with the data (05/04). I suppose that it was 05/05.

Reply: Figures in brackets refer to day and month. The question by the referee asks for a table footnote: dates indicate day/month. This will be added

11) Irrigation depths between treatments are very different, as discussed (page 703, line 21) due to the different distribution of rainfall. While in 2007 there is more rainfall (with a rainfall of 40 mm on May 15 at the end of the cycle) in the second year mentioned the need for greater irrigation depths in all treatments except for treatment W4. Why? Why do you apply four irrigation in 2006-07 and three in 2005-06? Is it relative to fertirrigation?. This situation can be influence in the results (over- or underestimation).

Reply: Yes, changes in 2006-07 relative to 2005-06 were due to fertigation and to adopting different irrigation schedules with irrigation thresholds defined for different soil water contents, say 70

12) Table 4. There is a super index in Dates. What is the meaning of?

Reply: The related table footnote is missing: dates indicate day/month

13) References Page 713, line 6; doi it is not necessary.

Reply: It will be deleted

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 697, 2009.