

Hydrol. Earth Syst. Sci. Discuss., referee comment RC3  
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## Comment on hess-2021-171

Anonymous Referee #3

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Referee comment on "Representation of seasonal land use dynamics in SWAT+ for improved assessment of blue and green water consumption" by Anna Msigwa et al.,  
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The paper "Representation of seasonal land-use dynamics in SWAT+ for improved assessment of blue and green water consumption" reports an application of the SWAT+ model in Africa. The authors implemented seasonal dynamic land-use in SWAT+ in order to improve vegetation growth simulation and to obtain more realistic temporal patterns of the blue and green water consumption from simulated evapotranspiration. Results of the simulations (static and dynamic seasonal land use) in terms of ET were compared to the ET values estimated by using remote sensing. The authors concluded that the seasonal land-use dynamic approach produces better ET results, which provides better estimations of blue and green water.

General comments:

The paper is very similar to a previous work that has been published in 2020 by the same research group (Nkwasa et al., 2020). The latter paper showed a better performance of the SWAT+ model by using the seasonal land use dynamic (ET at HRU level after the implementation of trajectories in SWAT+ model was compared to the default SWAT+ model). In addition, in 2019 the authors published a study carried out in the same basin applying SWAT+ with dynamic land use and the authors concluded that detailed seasonal land use maps are essential for quantifying annual irrigation water use of catchment areas. For these reasons, it seems difficult to find the novelty of the present paper. Hence, I invite the author to revise the introduction in order to better focus on the advancement of knowledge proposed in this study. Taking into account that the methodological approach (seasonal land-use dynamics in SWAT+) has already been published, the authors should better focus on the green and blue waters.

I suggest major revisions, the current version cannot be published in HESS.

Methodology:

a better description of the remote sensing ET evaluation is needed, the reference IHE Delft, 2020 is not listed.

More details on irrigation are needed, for instance, the source of water for irrigation (i.e. from the river, shallow aquifer, etc). Analyzing table 1, it seems that the option auto-irrigation was used. Please explain it. Did the author compare the amount of auto-irrigation to the actual irrigation (data provided by farmers)?

In my opinion, the equations and description of the RMSE, PBIAS, and NSE are not necessary.

For which period was the model run?

Figure 2 has already reported in Msigwa et al., 2019 and for this reason, I suggest do not report it here.

I suggest adding a new map in figure 3 with the land use (static land use).

Calibration needs a better presentation. It seems that the calibration was performed for the static and dynamic approach, please show the calibrated parameters in both simulations. A table with calibrated parameters for both simulations is expected. What about validation?

Result section:

Methods reported in Lines from 324 to 335 are not reported in the "Material and methods" section. What is the aim to show them in Figure 8? In my opinion, this section should be eliminated.

Line 335. Caption Figure 8. Msigwa et al. 2020 is not reported in the references. Is this reference the same as that reported in Line 355 Msigwa et al. 2021 (missed in the reference)?

Discussions:

Innovative aspects of your research should be highlighted and presented against the state-of-the-art. The authors reported (LINE 355 ) that blue and green ET estimates from SWAT+ for the mixed crop land-use show no significant difference in the values from the two methods (EK and SWB) assessed in the upcoming paper by Msigwa et al., (2021). This is not the aim of the present paper.

Please discuss the difference between Figure 5b and fig. 5c and their comparison with figure 7. I did not understand why static and dynamic ET do not match for static land use areas. In the upper right corner, figure5b shows the green areas in correspondence with the static land use (see fig 3). The large difference is difficult to explain with a different number of HRUs. In addition, a large difference remains between dynamic and satellite ET (Fig 5a and 5b) that needs to be explained.

Please discuss differences in water balance components between static and dynamic scenarios.

Please discuss the limit of the present study.

Conclusions need to be improved.

The authors reported, "The maps with calculated blue water use from the dynamic SWAT+ model correspond to the known irrigated area and the calculated blue water amount is in line with previous studies". The first assertion is obvious since the authors set the irrigation in that areas. The second was expected since the authors refer to their previous papers.

The paper needs to be carefully checked for typing errors (see some of them have been highlighted in the file enclosed)

Please also note the supplement to this comment:

<https://hess.copernicus.org/preprints/hess-2021-171/hess-2021-171-RC3-supplement.pdf>