Hydrology and
Earth System
Sciences

Open Access

Discussions

EGU

HESSD

Interactive
comment

Interactive comment on "Comparing SWAT with SWAT-MODFLOW hydrological simulations when assessing the impacts of groundwater abstractions for irrigation and drinking water" by Wei Liu et al.

Anonymous Referee #2

Received and published: 9 August 2019

Liu et al. present comparison of SWAT with SWAT-MODFLOW for the Uggerby catchment, Denmark. The study is well written with excellent level of detail provided in the method. I have no working knowledge of the models applied in this study, so my comments are high level, relating to the statistical interpretation of the results and their significance.

My main concern is that the conclusion that SWAT-MODFLOW is superior does not seem to be justified by model performances achieved in validation. Looking at Table 5, we see that the additional model flexibility offered by MODFLOW and MODFLOW

with PEST significantly increase calibration performance without improving validation performance significantly. This suggests that these models are simply over-fitting. I don't think this paper requires any additional experiments to be run, but I do suggest that the results need to be interpreted accurately. Unless the authors offer a convincing reason their current interpretation of the the results (based on their validation) I would suggest that the whole discussion and conclusions need to be rewritten to be more reflective of an honest appraisal of the model performances.

The other general issue is that the paper is very long. I think it can be shortened significantly without losing the key messages.

Specific comments:

Abstract - very long; considering shortening. Line 80 - no model considers the "entire" complexity. Please revise. Line 160 - please report % of crop production dependent on irrigation so the reader can get a sense of the importance. Line 173 - The hypothesis that the "benefits of applying SWAT-MODFLOW outweigh the costs" is one that can be tested objectively (and is not answered in your results). I suggest reframing the study so that the aim is to explore effects of introducing MODFLOW and MODFLOW pest into SWAT simulations in this particular catchment. Line 325 - Is the water stress threshold taken as a single value for the whole catchment? If so, what are the limitations of this assumption? Would the threshold vary according to crop type / soil type? Page 12 - the reader does not need to know the names of your python scripts. Figure 5 - not particularly helpful. I think this can be omitted. Line 478 (and throughout the results section)... lots of results reported in vague terms ("little higher", "much lower" ... etc). Please report % change instead. Line 552 - it does not reflect a shortcoming of SWAT groundwater module if the improvements are simply overfitting. Line 560 - this conclusion is not warranted if the model has been overfitted, as is suggested by results reported in Table 5. Figure 6 - remove background shading. Figure 10 - These are not promising results. Seasonal well drawdowns in the simulations are do not occur in the observations. Why should this not be reported as evidence of poor performance of

SWAT-MODFLOW? Lastly, the arbitrary labels attached to NSE scores ("satisfactory" etc) are inappropriate. Report the numbers, show the data, and let the reader decide what is satisfactory.

———————————————