Hydrology and Earth System Sciences Discussions

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Comment

Interactive comment on "Modelling water-harvesting systems in the arid south of Tunisia using SWAT" *by* M. Ouessar et al.

Anonymous Referee #1

This paper by Ouessar et al describes the application of the Soil Water Assessment Tool (SWAT) to the arid watershed of wadi Koutine in south east Tunisia. The SWAT model was modified to simulate the operation of two traditional water harvesting structures, and to allow the model to adequately represent Mediterranean arid cropping systems. The model achieved reasonable model performance criteria given the normal data issues in such regions. There are few published studies of the application of SWAT in truly arid climates, making this a potentially useful contribution to the literature. However, this present paper fails to provide this contribution.

It's critical weaknesses are:

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1) There is insufficient description of the model changes made to SWAT-WH. Given that this represents one of the main potential contributions of the paper, this is a significant limitation of the current manuscript.

(a) In Figure 3, there appear to be no losses or outflows from the water harvesting structure assumed to be represented by the dashed box that receives runoff from the HRUs, This suggests that there is no bed percolation / transmission losses, evaporation and that the water harvesting exactly matches the runoff from the multiple HRUs. Surely this is not the case, and this figure should be clarified

(b) I would recommend that Figure 4 is re-drawn to better represent the implementation of the traditional water harvesting structures within the context of SWATs representation of sub-basins

2) The results are very well described, but the discussion of the results is lacking- there is no justification that the model is producing correct results for the correct reasons. For example:

(a) In describing the simulated recharge, it is said that the recharge is too high but the reasons for this are not discussed. Might it be due to a different interpretation of the aquifers (between SWAT and the conceptual model of the system); that the simulation of actual evapotranspiration was wrong; or that the assumed soil profile was too thin, thereby limiting soil water availability etc?

(b) The discussion of the results focuses on runoff events, but does not demonstrate that the model is functioning correctly. During the occasional extreme rainfall events, the size of the runoff event might overwhelm the detail of the hydrological response of the catchment, so that the model is almost guaranteed to provide a response. I would expect to see discussion of the other elements of the model; Are the yields reasonable? is the irrigation volume appropriate? are the size of the transmission losses with the wadis consistent with Derouiche (1997) or other studies in the arid region etc etc.?

(c) The implications of using different raingauage allocation of the first 3 years pf the 12 year evaluation period is not discussed, Might this have contributed to the lower model performance during the evaluation period?

3) The water balance equation given for the "watershed" is incorrect as it does not represent the full water balance of the system. It may be that it is trying to represent the water balance of the landscape surface (soils and steams)

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