Hydrol. Earth Syst. Sci. Discuss.,
doi:10.5194/hess-2017-52-SC3, 2017

Hydrology and Earth System Sciences
Discussions
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EGU

Interactive comment on "Comparison of performance of tile drainage routines in SWAT 2009 and 2012 in an extensively tile-drained watershed in the Midwest" *by* Tian Guo et al.

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Received and published: 22 April 2017

Comments from Referee # 1ïijŽTesting of the new routines and identification of parameter sets is given as the primary motivation for this research. In my opinion, the given motivation and objective add very little to the scientific knowledge, thus, do not merit publication in HESS Journal in the current form. The authors claim that the parameter set obtained from this study provide guidance for field and watershed level applications. In fact, this is not a new and significant finding. Moreover, author do not provide any discussion on physical basis of the selected parameters.

R: We thank the referee #1 for the suggestions to our manuscript. Yes, we will provide more discussion on physical basis of the calibrated parameters and describe the

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relationship between the parameters and physical process of tile drainage. But we do not agree that our manuscript add very little to the scientific knowledge, or this is not a new and significant finding. We agree that tile drainage modeling using SWAT has been conducted in other watersheds. But this is the first one conducted in the LVR watershed. The soil and climatic characteristics, tile drainage system pattern, and management practices vary in different watershed. The research results in this manuscript could provide guidance for selection of tile drainage routines and related parameter sets for tile drainage simulation at both field and watershed scales. For example, well calibrated routines and related parameter sets in this study have been used for modeling of the impacts of bioenergy crop scenarios on streamflow, tile flow, sediment and nitrate losses in the LVR watershed from 1990 to 2008 (Guo et al., 2017, unpublished). Thus, this study is innovative and important.

Comments from Referee # 1ïijŽSome of the parameter values are also hard to understand, for instance, the range of snow fall and snow melt parameters seems too large (-5 to 5 âĎČ). From physical process point of view, it is hard to explain why these parameters are so different in such a small and mildly sloped watershed? To mention another example, why fitting values of SURLAG differ between sites (how scaling in hydrology may guide explaining this?). Similar can be said for other parameters like curve number, sediment and nitrogen related parameters. Therefore, the currently presented parameter sets adds very little to the available knowledge. A critical discussion on the fitted parameter values, at least explaining physical process related reasons and issues of spatial scales, is recommended.

R: Yes, we agree that the range of snow fall and melt parameters are large. We will narrow the range for the selected parameter and improve our calibration. Land use, soil, climate, pattern of tile drainage systems, and management practices are different in different stations, thus it is reasonable to have different calibrated parameter sets for tile drainage simulation. But they are similar with each other at different stations, rather than so different. We would like to thank the referee # 1 for the suggestions

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about a critical discussion on the fitted parameters. We will incorporate more in-depth discussion about how the calibrated parameter sets for different routines represent the physical process of tile drainage.

Comments from Referee # 1ïijŽAnother major problem is difficulty in following the structure of the paper. Presentation of calibration and validation results for each site demonstrates lot of repetition. This obstruct clarity and the readers could soon start feeling bored as same information comes again without any new insights and deeper discussion. One way of rectifying this issue could be by fully restructuring the paper. For example, results can be separately presented for each indicator (crop yields, flows, sediment, and nitrate) rather than per site. This can also facilitate physical explanation and scale issues when results of all sites for one indicator are combined together. For instance, when it comes to peak flow or runoff simulations, one can see where it was simulated well, at R5 or B or E etc, and then what could be the governing factors (geography, tile drainage density, variation in hydraulic conductivity, effect of CN etc).

R: We thank the referee #1 for the constructive suggestions about improving the structure of the manuscript. We will reorganize the results and discussion and present results for each indicator, to avoid repetition and improve flow of the manuscript. We will also relate parameter sets with physical process of tile drainage, and compare the performance of the old and new routines in simulating the same indicator at different sites. Yes, the same routine had different performance at different sites, which was mainly caused by different climatic characteristics and how the routine simulates tile flow. For example, old routine was better at site B, while new routine was better as site E. Difference in performance of different routines at B and E may be mainly caused by different climatic characteristics of two sites, and physical process in the old routines. The old routine in Rev.528 has the potential to overestimate tile flow peaks, since simulated tile flow by the old routine was controlled by a simple drawdown time parameter (TDRIAN), and tiles were allowed to carry an unlimited maximum of water no matter how intense the rainfall. Moreover, when water table was lower than tiles, the old rou-

tine could not calculate tile flow. Thus, Rev.528 has the potential to underestimate tile flow during dry periods. Thus, Rev.528 could not simulate tile flow peaks and tile flow during dry periods at site E.

Comments from Referee # 1ïijŽAlthough the study mentions previous research on testing the new tile drainage routine, the results of this study are not compared with the previous findings. A detailed comparison with the previous studies would help to understand and position this work much better. While doing so, the authors should at least include topics related to parametrization, characteristics of the studied watersheds, performance evaluation results.

R: We thank the referee # 1 for this valuable suggestion. The previous study on testing the new tile drainage routine evaluated performance of the routine in simulating streamflow on a tile drained watershed, without observed tile flow data at field scales. Thus, we will compare the previous studies with our calibration and validation at site R5, to improve the understanding of this study. The calibrated parameter sets, difference between characteristics of watersheds, and routine performance will also be incorporated.

Guo, T., Raj, C., Chaubey, I., Gitau, M., Arnold, J. G., Srinivasan, R., Kiniry, J. R. & Engel, B. A. (2017). Evaluation of bioenergy crop growth and the impacts of bioenergy crops on streamflow, tile drain flow and nutrient losses in an extensively tile-drained watershed using SWAT (under review).

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2017-52, 2017.