Hydrol. Earth Syst. Sci. Discuss.,
doi:10.5194/hess-2017-111-SC5, 2017

Hydrology and Earth System Sciences
Discussions
Open Access
EGU

Interactive comment on "The importance of parameterization when simulating the hydrologic response of vegetative land-use change" *by* Jeremy White et al.

J. White

jwhite@usgs.gov

Received and published: 2 April 2017

Thank you for your comments and I am sorry that you find the manuscript "poorly written". I realize our analysis involves a complex and nuanced subject matter and we will work to clarify the final manuscript. I would like to address many of your comments herein; I believe many of them are related to misunderstanding.

The purpose of our analysis, as stated in the abstract and the last paragraph of the introduction, is to evaluate the ability of a hydrologic model to simulate the effects of brush management and evaluate how parameterization may affect the ability to quantify uncertainty for this type of analysis. To that end, we are interested in simulating long-term water budget components after brush management as well as the changes in said

Printer-friendly version

Discussion paper

long-term water budget components. We are not interested in simulating streamflow after brush management and we have not attempted simulate post-treatment streamflow other than using the total post-treatment streamflow volume as a verification QOI. We apologize for the confusion and will try to clarify these points in the final manuscript.

Regarding the validation of the model, you believe the model was validated with streamflow data. Unfortunately, this is incorrect. We state the model was conditioned to streamflow, which is common practice in hydrologic modeling. You also believe that evaporation was not used to validate the model. Unfortunately, this too is incorrect. We state how evapotranspiration data were used for verification: using site-specific evapotranspiration data, collected as part of a previous analysis, we are able to verify the simulated pre- and post-treatment long-term water budget components; long-term water budget components are closely related to the purpose of the modeling analysis. We will work to clarify the use of ET data for verification in the final manuscript. The discussion with the other reviewer related to ET data you reference is a discussion about using these available ET data for conditioning, rather than for verification. The reviewer raised a great point regarding how these data might reduce behavioral uncertainty for QOIs. This discussion is more in the vein of the worth of data – an issue we will address in the final manuscript.

Thank you for your input regarding which processes and parameters you feel are most important to simulating the linkage between streamflow and evaporation, as well as your evaluation of the appropriateness of the Green and Ampt method in this analysis. For sure, how brush management is simulated in a given modeling analysis is subjective and different practitioners will choose to simulate the process of brush management differently. We discuss this very topic in the last paragraph of the discussion. We will try to enhance and clarify this part of the discussion in the final manuscript. I would also like to point out that the global sensitivity analysis was undertaken to objectively and directly evaluate which model inputs influence both the conditioning data and the QOIs.

Regarding an investigation of model uncertainty (model error), we do investigate one major source of model error: parameterization. It is a necessarily subjective process for any real-world modeling analysis, as practitioners must weight computation burden against the need to express input uncertainty. This source of model error is present in any real-world environmental modeling analysis.

Regarding your belief that the reduced parameterization model "fails", note that the reduced parameterization model still fits stream flow data acceptably well, according to established standards, and the reduced parameterization model also reproduces most of the long-term water budget components (verification QOIs) at the 95% confidence level. So, the reduced parameterization model does not "fail" as you indicate – in the absence of independent verification data (e.g., ET data), the fit to streamflow data alone would indicate the reduced-parameterization model is successful. The main issue we raise with respect to the reduced parameterization is that despite its ability to simulate observed streamflow acceptable well, it yields a much narrower QOI-5 distribution compared to the full parameterization. If the "true" value of QOI-5 could be known, then we could also verify both parameterizations against this QOI as well. Unfortunately, the true value of QOI-5 can never be known, so we can only compare the behavioral distributions yielded by the two parameterizations, which is a common approach in an investigation of model error.

Regarding your statement that all of the reviewed literature sources listed in Arnold 2012b are "not experienced", I do not think this is a fair or constructive comment. To our knowledge, most, if not all, of numerous modeling analyses referenced in Arnold 2012b are published in peer-reviewed journals and held to the high scientific standards. Do you have any published references regarding an appropriate parameterization strategy in the context of simulating the outcomes of brush management? If so, we will investigate these works and cite them appropriately.

Regarding the spatial distribution of rainfall, a preliminary analysis of the spatial distribution of rainfall over the watershed indicates little variability, it is a small watershed

Printer-friendly version

Discussion paper

after all. The rainfall data were combined for the purpose of filling missing values in the 5-minute frequency rainfall data. However, we will investigate this issue and include more discussion of this issue in the final manuscript.

Regarding your comments about the appropriateness of SWAT to simulate brush management, the SWAT model was selected because it has been used numerous times to simulate the outcomes of brush management in many settings. We are unaware of any literature showing the SWAT model is generally inappropriate for this purpose. In fact, our results show, through verification, the SWAT model can be employed as an appropriate tool for simulating the long-term water budget components before and after brush management in this watershed if an appropriate parameterization is used. These verification results, combined with results from previous, independent investigations of the watershed, give us confidence that the full parameterization model is performing reliably with respect to the purpose of the analysis. Because the model can reliably simulate the verification QOIs at a high confidence level, additional sources of model error are not relevant to this analysis as they are not important to achieve reliable uncertainty estimates related to the simulated outcomes of brush management in this watershed.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2017-111, 2017.

Printer-friendly version

Discussion paper