

## ***Interactive comment on “Optimizing micro watershed management for soil erosion control under various slope gradient and vegetation cover conditions using SWAT modeling” by Ghulam Nabi et al.***

**Anonymous Referee #1**

Received and published: 29 November 2017

The paper presents an application of SWAT model for soil erosion modelling in Pakistan in a region where soil conservation stone structures ('loose stone spillways') have been built. SWAT model is calibrated in a small catchment where these structures were absent, and calibration parameters have been applied to other 5 "micro" watersheds where the structures have been built to evaluate their impact on reducing soil erosion and sediment yields. Results indicate the potential for these structures to be applied to waste areas of Pakistan regions for slopes up to 4%.

The paper main interesting point in my view is the application of SWAT for a soil con-

C1

servation measures that has not been yet considered. These stone structures are not classic terraces, but rather armored weirs to dispose of runoff safely. (At least this is how I understood they are. Unfortunately, a clear description of these structures is missing.) this may be of interests for several semi-arid regions of the words where rocks are abundant.

While I appreciate a huge effort was done to set up and calibrate/validate the model, I found the paper badly organized, confusing, and missing much information. In particular, the upscaling work is badly explained, and it is not clear how SWAT model was used for this part, as the GIS analysis explaining how much of the regions can be conserved with these structures is independent of the model. for example, I cannot understand if the structures were built on areas of slope below 5% because of building/design constraints, but surely this is not a finding of model application, simply a measurement (line 30 of abstract).

The title is misleading. There was no work done on optimization and various gradient and vegetation conditions were not explored. I'd suggest reformulating the title mentioning the stone structures (spillway?).

In the introduction, the first 2 paragraphs are very repetitive and needs to be summarized into one. I think that given the focus of the work on micro-watersheds and 'loose stone soil conservation structures' installed in the region, these should be described in the introduction. Important information about the environment we are considering is missing: what is the mean annual precipitation ? what are the main crops of the region? What is the soil conservation policy that has been applied? Finally, please state the objective of the work at the end of the introduction.

In the portrayal of the region, a table introducing main characteristics of the 6 micro-watersheds used in the analysis should be added. Main land use types, average slope, area, mean precipitation etc. should appear in the table, this way the reader can gauge how similar the watersheds with structures are to the one used for model calibration.

C2

Model application: what was the warm-up period? How was runoff calibrated? Sediment calibration can only be done once runoff calibration is satisfactory. Please add runoff parameters to table 2 with final parameters too. Much of the text at page 6-7 describe rainfall events. this material could be presented as a scatter plot of measured vs predicted results. The choices about which sediment parameters to calibrate needs to be explained: e.g. USLE K, P and C are all part of the MUSLE equation, why not just calibrate one of the 3 parameters? This calibrated create confusion in the application of soil conservation measures. for example, USLE\_P was calibrated to 0.11, then in the presence of stone structures USLE\_P was set at 0.65, does it mean erosion would be higher i the presence of stones? Or that rather a  $0.65 \cdot 0.11$  factor was applied? What was the basis to change spcon and spexp?

Last but not least, conclusions 3-6 are not supported not explored by this study.

Figures 1 and 2 would need a location in Pakistan to better understand the region. Location of sites 2-6 could be added in Figure 1? What are the water bodies of figure 1, lakes/reservoirs?

I add an annotated manuscript scan for minor comments.

Please also note the supplement to this comment:

<https://www.hydrol-earth-syst-sci-discuss.net/hess-2017-532/hess-2017-532-RC1-supplement.pdf>

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2017-532>, 2017.