HESS-2016-649-RC2

We thank the reviewer for his constructive review and intend to address all of his comments.

1) The paper structure is a bit confused, the main objective of the study or the scientific question is not clear enough. Further, what are actually the main conclusions of the study, what is the take home message of this paper? Moreover, the language should be significantly improved (grammar, overall style and structure because some sentences are not clear). In its current form the paper is not suitable for the Hydrology and Earth System Sciences journal. The submission describes the estimation of transport capacity coefficient (KTC) in WATEM/SEDEM algorithm with the evaluation of RUSLE R factor using 1 min rainfall data in Han River basin of South Korea. The SWAT model, which includes the MUSLE function for calculating soil losses from the watershed, has been used to determine the WATEM/SEDEM sediment transport estimation. Studies such as this are relatively rare, and the model appears to be effectively calibrated and applied. This reviewer agrees that the manuscript contains novel information that could be useful for the readers of HESS. Much of the theoretical development presented in this manuscript is clear and well described. However, it reads more like a book chapter than a journal article. It is because the authors present few theoretical background and discussion of results, implications and limitations. For example, there is a lack of information regarding how the variation of KTC could affect the sediment yield at the sub-watershed scale. Moreover, several sections of the manuscript are not connected well, and importantly it is hard to understand what the major findings are. Although I generally recommend the paper for publication in HESS, I have the following comments which have, to my opinion, to be considered in a revised version.

- **Answer: Thank you for your comment. We consent to your comment. We think that all the following comments will go through from all your comments.**

2) Introduction. P2.L29-32: it confuses me why you used such long content to introduce SWAT studies, which are not the key topic of your study. I would like see a clear hypothesis (framework) of your study, following introduction of your aim line P2.L33-P3.L3. Then, if essentially, introduce some method to test your hypothesis.

- **Answer: Thank you for your comment. We consent to your comments. As you know, main objective of this paper is to fully develop distributed WATEM/SEDEM algorithm and assess KTC equation for estimation of KTC factor. At here, SWAT simulated daily sediment was assumed as daily observed sediment by calibration with measure 8-days sediment. Therefore, SWAT results serve as input data for estimation of KTC equation. So, we will correct this. We will remove sentences regarding SWAT studies and add paragraphs regarding introduce some method to test your hypothesis in part of 2 Materials and methods.**

3) Study area description. P4.L13-21: please introduce rough annual distribution of precipitation and temperature, e.g. precipitation mostly occurred in some month, min and max temperature over year. Add a description of land use and soil data modeled in this study. How were point sources of sediment, N and P accounted for? Figure 1: Please remove the layers that were not used in model calibration.

- **Answer: Thank you for your comment. We consent to your comment. Han River Basin in South Korea is either classified as a humid subtropical climate. Summers are generally hot and humid, with the East Asian monsoon taking place from June until September. August, the warmest month, has average high and low temperatures of 29.6 and 22.4 °C with higher temperatures possible. Winters are often cold to freezing with average January high and low temperatures of 1.5 and -5.9 °C and are generally much drier than summers, with an average of 28 days of snow annually. Sometimes, temperatures do drop dramatically to below −10.0 °C, in odd occasions rarely as low as −15.0 °C in the mid-winter period between January and February. An average slope of 35.9% and an average elevation of 404.7 m. More than 73.3% (25,030 km^2) of the watershed area is forested, and 12.2% (811 km^2) is cultivated. The cultivated area consists of 1,699 km^2 of paddy fields and 3,554 km^2 of upland crops. The dominant soil is sandy loam (51.0%). So, we will add watershed description above.**
- **Also, point sources mean sewage discharge. At point sources shown Figure 1, Domestic, agricultural, industrial water are treated and discharge such as flow, sediment, nitrogen, and phosphorus. The application of point sources in SWAT model improves accuracy of watershed modeling. So, application of point sources is required. We used point source data from the Ministry of Environment in South Korea. So, we will add description of point source data above.**

4) Method: Authors should provide proper justification to consider this approach for possible use in other studies. The differences and limitations should be included in the Methodology.

- **Answer: Thank you for your comment. We consent to your comment. We will certainly explain differences and limitations compared as other studies. We would like to state that the presented paper included various study such as models, algorithm and regression analysis. In this paper, TC equation in WATEM/SEDEM algorithm was firstly introduced to South Korea. The one of limitations is that WATEM/SEDEM algorithm can't consider land use compared as RUSLE. Someone can recommend the RUSLE equation than this algorithm. In order to improve the problem, we additionally regenerated KTC by considering agricultural area. In TC equation, we think that characteristics of land use represent KTC ranges. So, KTC**

shows difference between forest and agriculture. We will add differences and limitations above in the Methodology.

5) Model implementation. P5.L4-15: More detail about soils how similar were the attributes (e.g. soil type) of the sub-watersheds. How were data for the individual KTC determined?

- **Answer: Thank you for your comment. We consent to your comment. For estimation of KTC, K factor based on RUSLE equation is used as input data. By generating soil texture, K factor is estimated. As you ask, soil distribution is very important in estimating KTC factors. We didn't explain soil and K factor distribution. So, we will describe soil and K factor distribution for checking attribute of soils in sub-watersheds at revised manuscript.**

6) Results and discussion: Overall, the authors failed to provide a detailed report on the data obtained during the study and then need to discuss the importance of this study with regard to the relevant scientific or technical issues about sediment transport capacity. In this section, the authors simply explained the outcomes from model simulation that could not support to the significant results. Discussion should be concise and add only essential points in terms of the current results and limitations.

- **Answer: Thank you for your comment. We consent to your comment. This paper was not explained about generation of major data (rainfall erosivity, 1minute rainfall data, suspended solid, soil moisture, K factor, Soil…) for this study. We used soil moisture data at observed flux data by KICT (Korea Institute of Civil engineering and building Technology). Overall, we essentially didn't describe data sources and method for generation in detail. We will correct this and add sentences in part of 2 Materials and methods.**
- **Also, we agree with your discussion frame. The essential point of this study is to estimate sediment transport capacity and to KTC empirical equation for sediment transport capacity from results of SWAT and TC equation. Therefore, in order to apply accurate TC equation in South Korea, KTC value from KTC empirical equation is essential. So, we will rewrite three important points in Results and discussion. 1st point is a summary of SWAT and TC model results, 2nd point is to describe current results and limitations, 3rd is review the causes of uncertainty about KTC empirical equation.**

7) Conclusions: The findings of this study will be more useful if the authors can address how these findings will impact the evaluation of sediment transport capacity. Conclusions could be better stated by a better interpretation of the data and model predictions.

- **Answer: Thank you for your comment. We consent to your comment. There are two final findings in this paper. 1st finding is implementation of TC modeling for sediment transport capacity in South Korea and 2nd finding is estimation of KTC empirical equation. These findings could use more easily soil transport modeling compared to RUSLE and MUSLE because of simple input data. Also, using suitable empirical equation for South Korea, it is possible to predict the correct results. Therefore, the modeling proposed in this study could be recommended for soil transport or soil yield in ungauged watershed and areas in South Korea, because South Korea is mostly mountainous and difficult to measure data.**