HESS-2016-649-RC3

We thank the reviewer for his constructive review and intend to address all of his comments. We would like to state that the presented paper included various study such as models, algorithm and regression analysis. In this paper, WATEM/SEDEM algorithm was firstly introduced to South Korea. Also, we think that KTC empirical equation would be useful at ungauged watershed. For resubmission of improved paper, we think that all the following comments went through from the your reviews.

1) The paper needs a thorough English review. As of now the way it is written makes it very complicated to understand the research itself.

   - **Answer: Thank you for your comment. We consent to your comments. For language problems, we plan to get the native English speaker review/proofread through American Journal Experts (payment is about $ 500). We will attach editing invoice.**

2) Further major concerns are related to the paper structure, which appears very disorganised, in addition to the paper lack of clarity. As well, the material and methods are not sufficiently described, thus making this study unreproducible to others.

   - **Answer: The paper is outlined as follows: Sect. 1 described application of WATEM/SEDEM algorithm in South Korea. However, KTC (Transport Capacity Coefficient) is necessary for application of WATEM/SEDEM algorithm in South Korea. So, Sect. 2 traced KTC by the sediment delivery of SWAT model determined as comparing MUSLE (Modified USLE) based SWAT (Soil Water Assessment Tool) simulated sediment yield. The SWAT model results reflected observed suspended solid. Sect. 3 find out KTC empirical equation by linear regression analysis. The KTC equation is going to be commonly used for accurate sediment delivery at a ungauged watershed in South Korea. Finally, calibrated spatial sediment delivery from WATEM/SEDEM algorithm is estimated using obtained KTCs by KTC empirical equation.**

   - **The objective of this study is to estimate KTC empirical equation for calibrated spatial sediment delivery and to prove accuracy of sediment delivery by KTC empirical equation. Therefore, we consent to reviewer's comments. We are going to rewrite paper structure according to above purpose.**

3) The authors describe the two main sediment delivery method and SWAT model that are already coded and well known in the literature. However, they leave out a huge part of their method. How was the rainfall erosivity determined based on the 1-minute rainfall data? The authors do not describe the method used to define a spatial distribution of the rainfall erosivity, yet they presented it in the discussion session. The methods do not

describe how they calibrated their models.

- **Answer: Thank you for your comment. We consent to your comments. This paper was not explained about generation of 1 minute data and rainfall erosivity, calibration of SWAT model. Because methods for estimating rainfall erosivity and SWAT calibration are generally known in hydrology field, we don't mention detailed process. Also, we suggested a previous study thesis instead of detailed explanation, for example, the Ahn and Kim (2016). According to reviewer comment, we can give all the process in detail. Therefore, we will certainly explain generation of rainfall erosivity, data used in this study, and method of SWAT calibration in part of 2 Materials and methods.**

4) Many info on the study site, pertaining the method itself, are also missing (measured sediment? Soil characteristics?) Finally, the discussion itself is not broad enough to be convincing about the research value. Few lines are spent to describe the results in each subchapter; the reader is left just to see nice figures, that are however barely described in the text. I do not feel this is enough for a scientific paper. As well part of the results are actually.

- **Answer: Thank you for your comment. We consent to your comment. By reflecting your comments, discussion about results will be improved. Also, we will additionally analyze cause of error according to each sector. So, we will make up for the weak points in this paper. We will certainly explain soil characteristics in regard to rill erosion factor. 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.**

- **Answer: This paper was not explained about generation of major data (rainfall erosivity, 1 minute rainfall data, suspended solid, soil moisture, K factor, Soil…) for this study. For the reasons, we thought that the discussion has not sufficiently explained. Most of all, we must address how these findings will impact the evaluation of sediment transport capacity final purpose of this study.**

- **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.**

5) Some more detailed comments follow ABSTRACT Abstract needs rephrasing. Aside rom the english form, as it is now, it is very dense in acronyms and numbers, and this makes it hard to read. There is too much focus on the methods that, however, still do not appear clear to the reader due to the sentences structures. Furthermore, methods are mixed with results as well. The point of the abstract should be to be as clear as possible to give the idea of the study: as of now this is not accomplished at all. What is the aim of the study? The authors state is to estimate watershed scale sediment yield distribution, but the number given in the abstract refers to the rain erosivity, spatial KTC, and about the sediment yield the only information given is the relationship with the measured values. The paper afterwords describe a different aim of the study, which is to evaluate the KTC….

- **Answer: This paper was not explained about generation of major data (rainfall erosivity, 1 minute rainfall data, suspended solid, soil moisture, K factor, Soil...) for this study. For the reasons, we thought that the discussion has not sufficiently explained. Most of all, we must address how these findings will impact the evaluation of sediment transport capacity final purpose of this study.**

- **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.**

6) INTRODUCTION The introduction is very redundant and doesn't really get the point across. The whole introduction should be rephrased and reorganised. Line 9 to 16 page 2. This whole part is a mess. Line 10-11 do not make sense: "However, spatial data is often scarce possibilities to model spatial patterns of sediment delivery and to identify source areas of sediment are very limited". While this is a citation from another work, I think the author are missing some verbs or words or periods...

- **Answer: We wanted to mention importance of spatial pattern and data in regard to soil erosion. On your comments, the introduction wasn't clear. We will rewrite these paragraphs to improve completeness below. "The soil erosion and sedimentation require a basic understanding about the spatial processes of transport capacity. For understanding spatial process, spatial topography data are essentially needed. However, acquisition and generation of spatial data are very difficult (Haregeweyn et**

al., 2013). The soil erosion is related to the water flow and topography factors which is controlled by the abundance and type of vegetation, underlying soil, elevation."

7) Line 15-16 page? 2: "the sediment delivery ratio needs to be determine to generate the sediment."??? What does this mean? The sediment delivery ratio does not generate sediment. . . Line 17-20 page 2: numerous models exist. As the text is written now it seems that these models have been applied only in Ethiopia. I do not think this is true. If the authors choose to speak about each model and the locations where it has been applied, they should be consistent and nominate all the locations for all models. If not, the fact that it has been applied in Ethiopia can be removed.

- **Answer: Thank you for your comment. We consent to your comment. These models are not the models which were only applied in Ethiopia. The ANSP, LSEM, and SWAT models are widely used throughout the world for soil erosion. Therefore, we will suggest a previous study thesis about application of models and remove word or Ethiopia according to reviewer comment.**

8) Line 27-28 page 2: you can put the references together, no need to describe the specific application to Spain.

- **Answer: Thank you for your comment. We consent to your comment. The sentence is not about the only model application. The model is widely used throughout the world for soil erosion. We will describe various model application.**

9) Line 2 and 3 of page 3 states "the KTC is traced by the sediment delivery of SWAT model determined by comparing the MUSLE based SWAT simulated sediment yield", this sentence is very unclear. What is the aim of the study? The authors in the abstract state they want to evaluate the watershed-scale sediment yield distribution, but in the introduction, they state they want to assess the KTC (Transport Capacity Coefficient) of the TC equation, so which one is it? The abstract speaks of 14 years of rain; the introduction speaks about 15 years, please be consistent.

- **Answer: Thank you for your comment. We consent to your comment. We will consistently correct study period. The paper is outlined as follows: Sect. 1 described application of WATEM/SEDEM algorithm in South Korea. However, KTC (Transport Capacity Coefficient) is necessary for application of WATEM/SEDEM algorithm in South Korea. So, Sect. 2 traced KTC by the sediment delivery of SWAT model determined as comparing MUSLE (Modified USLE) based SWAT (Soil Water Assessment Tool) simulated sediment yield. The SWAT model results reflected observed suspended solid. Sect. 3 find out KTC empirical equation by linear**

regression analysis. The KTC equation is going to be commonly used for accurate sediment delivery at a ungauged watershed in South Korea. Finally, calibrated spatial sediment delivery from WATEM/SEDEM algorithm is estimated using obtained KTCs by KTC empirical equation.

- **The objective of this study is to estimate KTC empirical equation for calibrated spatial sediment delivery and to prove accuracy of sediment delivery by KTC empirical equation. Therefore, we consent to reviewer's comments. We are going to rewrite paper structure according to above purpose.**

10) METHODS The authors describe the two main sediment delivery method and SWAT model, that are already coded and well known in the literature. However, they leave out a huge part of their method. How was the rainfall erosivity determined based on the 1-minute rainfall data? The authors do not describe the method used to define a spatial distribution of the rainfall erosivity, nor how they calibrated the model. Many info on the study site, pertaining the method itself, are also missing (measured sediment? Soil characteristics?).

- **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.**

11) DISCUSSIONS The discussion is very short. Too much. There is no mention of any relationship with other studies in the literature, nor details on how these results could be useful for other researchers in the field. The discussion is mainly spent in figures, which are however barely described or commented. just to mention some issues, in chapter 3.1 the maps are not described in the text, are they a result? Are they part of the method? Where do they come from? What is their use? In chapter 3.2 the authors seem to focus

more on calibration and validation, which is part of the method. However, they do not give enough information, and they refer the reader to unpublished studies (e.g. line 12 page 8)....

- **Answer: Thank you for your comment. We consent to your comment. As you mentioned, this paper was not explained about generation of major data (rainfall erosivity, 1 minute rainfall data, suspended solid, soil moisture, K factor, Soil...) and detailed process for this study. For the reasons, we thought that the discussion has not sufficiently explained. Most of all, we must address how these findings will impact the evaluation of sediment transport capacity final purpose of this study. Also, we will compare final founding with other study results. However, there were no comparable domestic studies, because TC equation in WATEM/SEDEM algorithm was firstly introduced to South Korea in this paper. Finally, we are believed that development of KTC equation can be used as a tool to improve the results of existing overseas research. This is the conclusion in this study. On your comment. The discussion about results will be improved.**

- **Also, paper by Ahn and Kim (2016) was finally accepted. So, we will correct this.**