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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Estimation of soil erosion considering soil loss tolerance in karst area" *by* Yue Cao et al.

Yue Cao et al.

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Dear reviewer: I am very grateful to your comments for the manuscript. According with your advice, we amended the relevant part in manuscript. Some of your questions were answered below. Overall comments: Dear Reviewers: Thank you for your concerning our manuscript. Those comments are all valuable and very helpful for revising and improving our paper, as well as the important guiding significance to our researches. Some of your questions were answered below. 1. Due to the congenital deficiency of the soil-forming materials, the karst area has a slow soil formation, a thin soil layer, even no soil in many areas. Actual soil holdings are much smaller than their theoretical erosion. Therefore, it is necessary to estimate soil erosion considering the soil loss tolerance.

2. Thank you very much for the careful review of the reviewers. Your suggestion summarizes the main research contents of this article to some extent. By carefully referring to the opinions of the reviewers, we have carefully revised the contents of the manuscript, sorted out and revised the framework of the article. The attention is on the unique geological background and geomorphological features of the karst area, and fully explained the importance of soil allowable loss assessment. Therefore, we still focus on the accurate estimation of soil erosion. We believe that your proposal has important guiding significance for our future work. In the future work, we will focus on your suggestion and hope to make new breakthroughs in soil and water conservation in the karst area.

Specific comments: 1. Thank you for your careful work. We have revised all word spacing in the text.

2. Thank you for your careful work. We have unified the units and abbreviations of soil erosion, including R factor and K factor.

3. Thanks for your suggestion. We have replaced "idea" by "procedure"

4. Thank you for your careful work. Here we refer to the research of Wei et al (2011).

5. "The exposed karst" refers to the karst outcrop area, meaning that the surface rock is carbonate rock.

6. Thanks for your suggestion. We have referred the historical authors Wishmeier et al. (1978) and Mocool et al. (1989) proposed the algorithm formula to estimate slope length factor.

7. Thank you for your suggestion. There is no doubt that the slope length factor is one of the most important factors for estimating soil erosion. The DEM resolution and the choice of the processing algorithm of different slope length factor algorithms all affect its results. In this study, because the region covers 2.86$\times$105 km2, the highest data accuracy we can obtain is 30m for the study. The slope length algorithm refer to the

Wischmeier et al.(1978)) and Mocool et al. (1989), then the value of slope length index based on the results of Fu et al. (2015). Meanwhile, its soil layer is thin in our study area, soil conservation is very small, and there are even soilless conditions in many areas. Therefore, this paper focuses on estimating the allowable soil loss in karst area, and correcting the amount of soil erosion with it. We will consider your suggestion in the future work, thank you again.

8. This paper refers to the previous research results and combines the local land use and agricultural activities to determine the P value (Xu et al., 2011), assigns the P factor value to the corresponding land use (Table 2), and obtains the P factor map of the study area. The obtained value is within 0–1. If the value is 0, then the area is not affected by soil erosion; if the value is 1, the area has not been subjected to any soil or water conservation measures. For the study area, paddy fields have basically been terraced, but a considerable part of the dry land has not taken any measures.

9. It refers to the amount of soil loss equal to soil formation rate (Lan et al. 2009).

10. Thank you for your careful work. We have changed it to “When the rate of soil erosion is greater that of soil formation of the parent rock.”

11. According to classification and gradation standards of soil erosion (SL190-2007, 2008), we divided soil erosion into six grades, which are micro-degree (A$\leq$5 tÂůha-1Âůyr-1), mild (5 tÂůha-1Âůyr-1<A$\leq$25 tÂůha-1Âůyr-1), moderate (25 tÂůha-1Âůyr-1<A$\leq$50 tÂůha-1Âůyr-1), strong (50 tÂůha-1Âůyr-1<A$\leq$80 tÂůha-1Âůyr-1), pole strong (80 tÂůha-1Âůyr-1<A$\leq$150 tÂůha-1Âůyr-1) and violent (A>150 tÂůha-1Âůyr-1).

12. Thank you for your suggestion. We have identified the factor for each map in Fig.3 (Fig.2 before). In addition, we use mask to remove water, towns and other areas that do not produce soil erosion, and the soil erosion modulus is no data.

13. Thank you for your careful work. We have rewritten this sentence as follows: “Compared with non-karst areas, the karst area with wide carbonate rocks has the

characteristics of low soil formation rate and less soil. Therefore, the actual erosion of soil in the karst area will not exceed the allowable loss of soil.”

14. Thank you for your careful work. We have changed this to “the soil formation rate of other rock types”.

15. Thank you for your careful work. This refers to non-carbonate rock, we have changed the full text to other rock types, the value of soil formation rate is determined according to classification and gradation standards of soil erosion (SL190-2007, 2008).

16. Thank you for your suggestion. We have already indicated the unit of soil loss tolerance Figure 4-a, and Fig.4-b is graded according to classification and gradation standards of soil erosion (SL190-2007, 2008)

17. First, we estimate soil erosion based on RUSLE model, but the soil formation rate is slow and the soil layer is thin. The actual soil formation is much smaller than the theoretical erosion amount, which is not in line with objective reality. Therefore, we estimate the rock weathering rate in the carbonate rock area as the maximum threshold of soil loss tolerance, and replace the soil erosion with the soil loss threshold in the area where the soil erosion in theory exceeds that.

18. Thank you for your careful work. I am sorry that this is a mistake in our work. We have changed the unit of erosion area to ha.

19. Discussions. In chapter 4.1, we specified the reason of double thresholds of rainfall erosivity in karst. In chapter4.2, we compared our result with others studies of soil loss tolerance in karst area, and proved the correctness of the calculation of the allowable loss of soil. Furthermore, we also compared the soil erosion modulus corrected by the soil loss tolerance with other field or experimental data in Table 5 (chapter4.2), which proved the necessity and reasonable of the correction.

20. Thank you for your suggestion. We have changed the title of table 5 to “Comparison with the Experimental results”, in which, we compared other field or experimental data

with our estimates in text of soil erosion modulus, proving the reasonable of the our correction.

We would like to express our great appreciation to you for comments on our paper. Sincerely yours, Yue Cao Corresponding author: Name: Xiaoyong Bai E-mail: baixiaoyong@126.com

Please also note the supplement to this comment:
https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2018-310/nhess-2018-310-AC2-supplement.pdf

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