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Interactive comment on "Evaluating soil erosion and sediment deposition rates by the ^{137}Cs fingerprinting technique at karst gabin basin in Yunnan Province, southwest China" *by* Yanqing Li et al.

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Revision Note for Reviewer 2

This paper aims to quantify the erosion and sediment deposition rates in the Karst region of Southwest China using 137Cs tracing technique. Further, the authors evaluated the relationships between 137Cs and selected soil properties (soil pH, total nitrogen, total phosphorus, and SOC content) by PCA analysis. The purpose of this study is worth giving the intensity of soil erosion in the area. However, I have many concerns about the conclusions: Dear reviewer 2, also, thanks a lot for your time invested in our manuscript. We highly appreciate your comments and suggestions. We tried to do our best in order to improve our research and clarify all your concerns.

1. The authors only sampled 10 soil cores (nine along 3 transects and one from the depression). I think the size of samples is inadequate for obtaining a catchment-scale conclusion, e.g. Line 20 “the sediment delivery ratio summarized 0.82 in the whole catchment according to the square of hillslope and depression bottom”. Given the complexity of topography of the study area showing in Fig. 1, erosion rates and soil properties can be highly variable.

Response: Thank you very much for your comments. Of course, understanding the high heterogeneity of soils need an elevated number of plot sites to increase the precision. The depression we choose is a small closed watershed. We chose different hillslope positions for sampling in order to decrease the heterogeneity. We consider that it can be adequate to get the small catchment-scale conclusion as other authors also found karst areas (Bai et al, 2010; Zhang et al, 2010, etc.). However, we included this idea as also suggested the reviewer 1.

2. Statistic relationship between 137Cs and soil properties cannot be obtained by PCA (Line 25). The angle between two variables in PAC Biplot just indicates a tendency of correlation. The authors should perform simple correlation analysis to confirm the statistic results. Further, PCA is a technique for reducing the dimensionality of complex datasets, increasing interpretability. I can’t see the necessity to perform PCA in this paper in its present form. I would suggest authors try to 1) explain the first two components 2) combine PCA with PERMANOVA to examine how do measured variables differ between slope positions. Then reconsider the necessity of using PCA. Response: Thank you very much for your comments. We used an Anova for distinguishing the soil properties at different slope positions. We also performed the correlation analysis of the soil properties. However, we would want to conserve the use of the PCA in this paper, because it was really useful to observe and reduce the number of parameters able

to explain the interactions among soil processes at the hillslope scale. As we included a new analysis (linear correlation and Pearson correlation), we will wait for your new valuable evaluation to observe if you find now interesting this new approach. If not, we will delete it.

3. §3.2 Authors presented the variation of 137Cs and soil physicochemical properties for selected hillslope at different soil depths. It is not clear which slope position you selected for such comparison? Only shoulder position or plus foot slope? Why? Response: Thank you very much for your comments. Sorry, we did not express it clearly. The three hillslope positions were compared and now included in the text. We deleted the confused words.

4. §5 In conclusions (Line 295), authors mentioned that "on the shoulder and backslope, the maximum of 137Cs appears in the soil subsurface layers, whereas at the footslope, the maximum appears in the topsoil parts ". I will doubt this conclusion unless the SD value can be reported in Fig. 2. Its important because what I can see from Fig. 2 is that there might be no difference (if high SD) between 0-5 cm (topsoil) and 5-10 cm (subsurface) at backslope and footslope. From my point of view, it's reasonable that no difference of 137Cs values between 0-5 cm and 5-10 cm because of the mixed effect of tillage practice. Response: Thank you very much for your comments. We added the SD values in Fig.2 because we agree with your valuable opinion. There are no differences of 137Cs values between 0-5 cm and 5-10 cm unless that we include more data such as SD.

5. Please report the slope gradients in Table 2, then we can see the rationality of your explanations for the factors driving erosion rates (, Line 297). Response: Thank you very much for your comments. We added the slope gradient in Table 2.

6. This paper showed that soil erosion was greater in either upper and lower hillslope parts than in the middle one (Line 235), and authors attribute these patterns to the slope gradient. I think another possible reason is that the coexisting of tillage erosion

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and water erosion. Typically, tillage erosion is the main cause of soil loss at the concave position (ref. to Lobb D.A. 1999), i.e. shoulder position (upper parts), while water erosion leads to serious soil loss at lower slope position (these areas received maximum runoff concentrations).

Response: Thank you very much for your comments. It is a great idea! We included this in the discussion part. Thanks.

Technical comments: 7. Line 23: "......play the most important role in WHAT?

Response: "in influencing 137Cs".

8. Line 113: is there inorganic C from the soil samples? If so, how did you remove it?

Response: There is inorganic C. But our research only paid attention to soil organic matter.

9. Line 160: add SD to 137Cs concentration. Response: We added the SD.

10. Line 175: Fig.2 rather than Fig.3? Response: we revised it.

11. Line 242: please add a reference Response: We added.

12. Line 245-246: what you mentioned here is not correct according to Fig. 2. Please check it carefully. Response: Revised it.

13. Line 261: please add ref. here to show where is this data from Response: We added it.

14. Line 297: check spell of letters. Response: We checked and revised the letters.

Please also note the supplement to this comment:
https://www.soil-discuss.net/soil-2019-94/soil-2019-94-AC2-supplement.pdf

Interactive comment on SOIL Discuss., https://doi.org/10.5194/soil-2019-94, 2020.

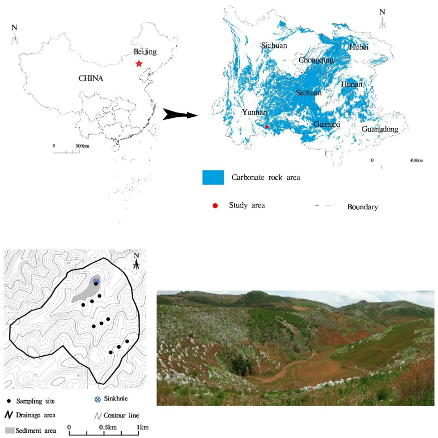

Figure 1: Localisation of the study area, sampling points and panoramic image of one selected plot.

Fig. 1.

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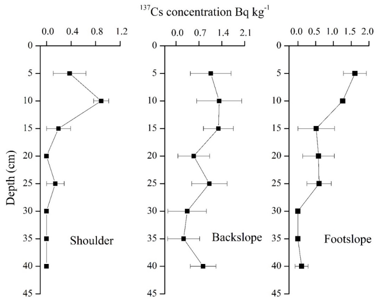

Figure 2：^{137}Cs concentration distribution features at different hillslope positions.

Fig. 2.

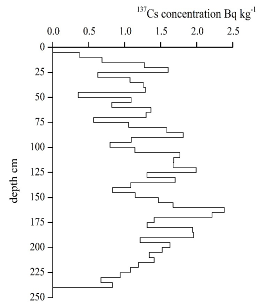

Figure 3: ^{137}Cs depth distribution features in depression bottom.

Fig. 3.

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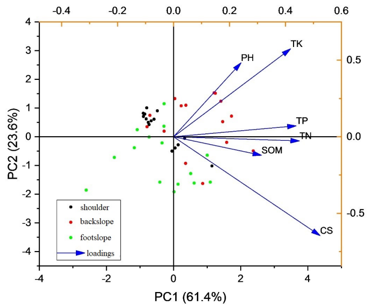

Figure 4: Eigenvectors from the principal component analysis (PCA) of the first two components.

Fig. 4.

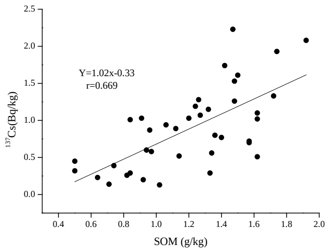

Figure 5: Linear correlation between ^{137}Cs and SOM (Soil Organic Matter) content.

Fig. 5.

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