

Reviewer 1

This study presents an evaluation of the interaction between slope steepness and antecedent moisture content on several aspects of interrill erosion for three distinct soil types. These aspects are, namely, splash detachment, infiltration, runoff, and soil loss. They are evaluated for three soils from a small watershed in Ethiopia using small-scale lab experiments. Further, the study tests the validity of more traditional erosion models to predict the observed erosion from the lab experiments. It is shown that static parameters that do not consider antecedent conditions or the interaction of various factors are unable to fully represent interrill erosion processes.

In general, the research in and of itself is of good quality and the results appear to be useful from a general erosion process point-of-view. In addition, these results are valuable due to the extreme lack of process understanding and representation ability with respect to soil erosion that currently exists in regions like Ethiopia. There are, however, several aspects of the study that could be clarified and the general quality of the written text must improve significantly before this manuscript can be accepted for publication in HESS. With that, I would recommend that the authors perform major revisions to this manuscript to help improve the quality of the presentation and readability. I present a few general comments in the following that the authors should consider and provide some more detailed/editorial comments at the end of this review.

Response: ***We would like to thank the reviewer for the helpful comments; almost all have been incorporated directly into the manuscript.***

Comment: The number of tables included is overwhelming and excessive! These many smaller tables must be combined into a few larger tables. In addition, some of the less important tables could be moved to the Supplementary Material section. I would suggest merging Tables 2, 4, and 6 together. It also makes sense to put Tables 5 and 7 together and Tables 8 and 9 together. Finally, I suggest putting Tables 11 and 12 together and moving Table 10 to the supplemental information section since it is mostly correlation coefficients and can easily be covered in the main text.

Response: ***We have reduced the number of tables by merging some of the tables and taking to the supplementary Material section***

In the Methodology section, there are far too many small subsections. The authors should restructure this section. I suggest the following or something similar should be done. Section 2.1 should be renamed 'Experimental design and treatments'. Sub-section headings 2.2, 2.2.1, 2.2.2, 2.2.3, and 2.2.4 should be removed and these sections simply combined under the new Section 2.1. Sub-section 2.2.5 should be renamed 'Sample collection and analysis'. Sub-sections 2.2.6, 2.2.7, 2.2.8, and 2.2.9 should be removed and these sections combined.

Response: ***We have restructured the methodology part by merging different subsections***

All the text from P6457L11 through P6458L14 should be removed since this is stated in the introduction. The authors can just reference back to these originally stated equations. What definitely must be

include, however, is a full description of how these models were fit. This can be tricky especially when the models have multiple parameters to adjust. What influence did the selected fitting procedure and/or selected objective function have on the results presented in this study?

Response: **We have removed all the text from P6457L11 through P6458L14 and a full description about the model and the fitting procedures have been added in the manuscript**

In the first part of the following Minor/Editorial Comments section, I have tried to assist the authors by providing a detailed and thorough list of grammatical errors and suggested corrections in the manuscript's Abstract and Introduction sections. However, it is not possible (nor the role of a reviewer) to provide such a thorough detailed list of grammatical corrections for the entire manuscript. As such, the authors should do a more thorough job proof reading the text to make sure the quality of the grammar is acceptable. It is suggested that the detailed list of corrections given in the following be used as guidelines in this process. In addition, I would recommend that the author consider using a third-party editorial service or writing assistance facilities available at their institute (Florida International University in particular) to help in improving the quality of this text.

Response: **We thank you for the detail comments given and these helped us to improve the quality of the paper. We have made significant change on the paper to make sure the quality of the grammar is acceptable**

Minor/Editorial Comments

Abstract:

P6448L5: Change 'The' to 'This'

Response: **We have made the suggested changes**

P6448L9: Change to 'simulated rainfall for a total'

Response: **We have made the suggested changes**

P6448L9: Change 'Rainfall intensity at' to 'Rainfall intensities of'

Response: **We have made the suggested changes**

P6448L13: Here and everywhere: Whenever you talk about 'splash' it is more appropriate to say 'splash detachment'

Response: **We have made the suggested changes**

P6448L14: Change 'washed' to 'the amount of washed'

Response: **We have made the suggested changes**

P6448L15: Change ', and' to 'while the amount of'

Response: **We have made the suggested changes**

P6448L17: Change 'rate' to 'the rate'

Response: **We have made the suggested changes**

P6448L18: Delete 'soil,'

Response: **We have made the suggested changes**

P6448L19: Change 'soil Regosols' to 'Regosol soil'

Response: **We have made the suggested changes**

P6448L19: Change 'was not' to 'were not'

Response: **We have made the suggested changes**

P6448L22: Change 'For' to 'For the'

Response: **We have made the suggested changes**

P6448L25: Change 'the rainfall intensity based model' to 'rainfall intensity based models'

Response: **We have made the suggested changes**

P6448L25: the sentence starting with 'The exponent...' is out of context and needs rewritten to help the reader understand.

Response: **We have made the suggested changes**

Introduction:

P6449L3: Delete 'its'

Response: **We have made the suggested changes**

P6449L10: Insert 'including' after 'land'

Response: **We have made the suggested changes**

P6449L11: Change 'which means to' to 'and'

Response: **We have made the suggested changes**

P6449L12: Delete 'an'

Response: **We have made the suggested changes**

P6449L13: Delete 'it needs'

Response: **We have made the suggested changes**

P6449L14: Change 'quantifying' to 'quantification of'

Response: **we have made the suggested changes**

P6449L15: This statement about the Alemaya watershed comes out of place. Consider a better introduction here.

Response: **We have made the suggested changes**

P6449L17: Change 'turn to' to 'turn'

Response: **We have made the suggested changes**

P6449L20: Change 'resistant' to 'resistance'

Response: **We have made the suggested changes**

P6449L27: Delete comma after 'and'

Response: **We have made the suggested changes**

P6449L28: Consider changing 'affects' to 'influences'

Response: **We have made the suggested changes**

P6450L3: Change 'those factors on' to 'these factors on the'

Response: **We have made the suggested changes**

P6450L5: Change 'varies' to 'vary'

Response: **We have made the suggested changes**

P6450L6: Change 'interaction' to 'interacting'?

Response: **We have made the suggested changes**

P6450L7: Change '(Meyer, 1981; Foster, 1982)' to 'Meyer (1981) and Foster (1982)'

Response; **We have made the suggested changes**

P6450L9: Change 'mainly' to 'can be'

Response: **We have made the suggested changes**

P6450L11: Make b italics

Response: **We have made the suggested changes**

P6450L12: Change 'fraction. And the exponent, b ,' to 'such that the exponent'

Response: **We have made the suggested changes**

P6450L16: Here and everywhere: are you sure you mean by definition and not equals?

Response: **We have changed all to equals**

P6450L17: Here and everywhere: I think the common way to write this is 'where' with a lower case w and no punctuation. Please check this and be consistent.

Response: **We have made the suggested changes**

P6450L20: Here and everywhere: It is more common to give the full name or term then the abbreviation. Here, for example, it should be 'Water Erosion Prediction Project (WEPP)'

Response: **We have made the suggested changes**

P6450L22: Delete 'that was' and change the second 'was' to 'were'

Response: **We have made the suggested changes**

P6450L26: Add period after 'dimensionless'

Response: **We have made the suggested changes**

P6451L4: The P should be p ? Also, should this be a fitted exponent, too?

Response: **We have made the suggested changes; yes, it is a fitted exponent**

P6451L7: Change 'the proposed model that give' to 'proposed models that give'

Response: **We have made the suggested changes**

P6451L8: Delete 'as Eqs. (1), (2), and (3)'

Response: **We have made the suggested changes**

P6451L9: Change ', which' to '. This'

Response: **We have made the suggested changes**

P6451L10: Change 'and' to 'but'

Response: **We have made the suggested changes**

P6451L10: Change 'the' to 'this'

Response: **We have made the suggested changes**

P6451L16: Change 'researcher' to researchers'

Response: **We have made the suggested changes**

P6451L22: Change 'relationship on' to relationships for'

Response: **We have made the suggested changes**

P6452L1: Change 'data were' to 'data used in that study were'

Response: **We have made the suggested changes**

P6452L2: Use % throughout.

Response: **We have made the suggested changes**

P6452L5: Add a period.

Response: **We have made the suggested changes**

P6452L7: Change 'assumed' to 'assume'. Be careful of shifting the tense of your verbs throughout.

Response: **We have made the suggested changes**

P6452L8: The sentence starting with 'The relationship...' is poorly written as needs improved.

Response: **We have improved the sentence**

P6452L13: Change 'steepness' to 'steepness. This is because'

Response: **We have made the suggested changes**

P6452L14: Change 'in interrill' to 'in the interrill'

Response: **We have made the suggested changes**

P6452L17: Change 'are also' to 'which are'?

Response: **We have made the suggested changes**

P6452L20: Rewrite sentence to read 'Erosion is often less on slopes steeper than this.'

Response: **We have rewritten the sentence**

P6452L22: The first sentence of this paragraph is far too long and must be split into 2 or 3 sentences.

Response: **We have made the suggested changes**

P6453L1: Insert 'is often' before 'less'

Response: **We have made the suggested changes**

P6453L4: Change 'very little research work' to 'lack of research'

Response: **We have made the suggested changes**

P6453L7: This should be (2) and the following (3)

Response; **We have made the suggested changes**

P6453L10: Change 'that slope' to 'that the slope'

Response; **We have made the suggested changes**

Rest of the text:

P6453L15: Change 'The study area, Alemaya, is' to 'This study consists of a lab-based soil erosion experiment on soil found in the Alemaya watershed'

Response: **We have made the suggested changes**

P6453L22: Remove semicolon after 'that'. Please be careful through out with the excessive and often incorrect use of punctuations. For example, many commas could (and should) be removed.

Response: **We have made the suggested changes**

P6454L2: Change 'In this study' to 'The' and remove the words 'was' and '. The equipment'. Finally, put a colon after the word units on the next line and remove the comma after 'simulator'.

Response: **We have made the suggested changes**

P6454L8: Remove 'that varied in texture were taken' and 'These soil materials' on the next line.

Response: **We have made the suggested changes**

P6454L12: Have you introduced these abbreviations before? You should make it clear in the text which is Soil A, B, and C. Also, is anything gained by these generic abbreviations? Why not consider using the soil names or textural classes (which inherently contain more information) to refer to the soils throughout? Regardless, pick a convention, introduce it and use it consistently.

Response: We have introduced it in the material and we have used it consistently

P6454L16: Change 'a 90' to '90'

Response: **We have made the suggested changes**

P6454L25: Change 'Eventhuogh' to 'Regardless'

Response: **We have made the suggested changes**

P6455L2: Remove semicolon and change ' has' to 'have'

Response: **We have made the suggested changes**

P6455L4: Remove 'used for experiment'

Response: **We have made the suggested changes**

P6455L9: Change 'wash, and Drainage outlet' to "wash. Drainage outlets'

Response: **We have made the suggested changes**

P6455L15: Here and throughout, why not use a % sign?

Response: **We have used % sign**

P6455L15: Remove 'that' and change 'pan, and' to 'pan.'

Response: **We have made the suggested changes**

P6455L19: Change 'for total' to 'for a total'

Response: **We have made the suggested changes**

P6456L3: Remove 'from splash collector and runoff, and wash collector respectively'

Response: **We have made the suggested changes**

P6456L4: Remove semicolon

Response: **We have made the suggested changes**

P6456L6: Change 'sand sized' to 'sand-sized'

Response: **We have made the suggested changes**

P6456L9: Remove 'times'

Response: **We have made the suggested changes**

P6456L11: Change 'strength were measured in each post' to 'strengths were measured after each'

Response: **We have made the suggested changes**

P6456L12: Delete 'various researchers such as'

Response: **We have made the suggested changes**

P6456L14: What equation?

Response: **We have made the statement clear in the manuscript**

P6456L20: Change 'the standard procedures, and means were separated by' to 'standard procedures and means were separated'

Response: **we have made the suggested changes**

P6457L8: Remove 'while the other'

Response: **We have made the suggested changes**

P6457L9: Change 'is rainfall' to 'is a rainfall'

Response: **We have made the suggested changes**

P6458L17-19: Move these into the Methodology section.

Response: **We have moved into the methodology**

P6458L26: Remove 'at a significance level of'.

Response: **We have made the suggested changes**

P6459L5: By 'Numerically' do you mean 'The total amount of splash detachment'? Numerically is probably not the word you mean here.

Response: **we have deleted the word and modified the sentence**

P6459L20: Remove 'Close observation of Table 3 indicate that' and end this sentence with '(Table 3)'. This is a much nicer way to reference a table.

Response: **We have made the suggested changes**

P6459L28: Change 'had' to 'have'

Response: **We have made the suggested changes**

P6460L3: Remove 'at'

Response: **We have made the suggested changes**

P6460L5: Remove comma before 'and' and change 'values' to 'value'

Response: **We have made the suggested changes**

P6460L10: Put % sign behind both numbers (here and everywhere)

Response: **We have made the suggested changes**

P6460L12: Change 'slopes, steepness greater than 33%' to 'slopes (greater than 33%).'

Response: **We have made the suggested changes**

P6460L19: Change 'wet' to 'under wet conditions' or similar. Make this correction throughout the rest of the text. The reference to Soil B-wet has not been introduced and is confusing.

Response: **We have made the suggested changes**

P6460L26: Change 'strength, the' to 'strength. The'

Response: **We have made the suggested changes**

P6460L27: Change 'Different' to 'Differences'

Response: **We have made the suggested changes**

P6461L2: Change 'possibly' to 'likely'

Response: **We have made the suggested changes**

P6461L6: Again (and throughout): consider 'likely' instead of 'possibly'

We have made the suggested changes throughout

P6461L11: Delete 'Here'

Response: **We have made the suggested changes**

P6461L12: Rewrite the sentence starting with 'Runoff rate...' Probably would be clarified using a different soil naming convention (see previous comments)

Response: **We have made the suggested changes**

P6461L19: Delete 'that reduce the amount of runoff; in this study'

Response: **We have made the suggested changes**

P6461L20: Remove 'soil' after 'C' (do this everywhere!)

Response: **We have made the suggested changes**

P6461L21: Remove 'particles than the others'

Response: **We have made the suggested changes**

P6461L23: Change to 'effects'

Response: Response: **We have made the suggested changes**

P6461L25: Change 'was might be due to' to 'is'

Response: Response: **We have made the suggested changes**

P6461L26: Why is it 'high sand particle' and not high percentage sand?

Response: **We have changed to high percentage sand**

P6461L28: What capacity rate?

Response: **we have made the statement clear in the manuscript**

P6462L1: Here and everywhere: instead of 'at $p=0.0001$ ' or all these different p values you report, just define what a p value that is highly significant in the methodology section. For example, add a sentence like: 'In this study, all relations with $p<0.05$ are considered as significant.' I would add this around P6457L1. Then you can remove all this different p values in the rest of the text (which are presented incorrectly!!)

Response: **We have made changes throughout**

P6462L1-5: This is confusing. How is there a significant effect in the first sentence and then it is not in the third? Rewrite and be clear.

Response: **We have corrected it and made it clear**

P6462L7: Here and everywhere: I think you are not using word 'numerically' in an appropriate manner. I think you can just remove it everywhere to avoid the issue.

Response: **We have removed it everywhere**

P6462L20: Change 'high runoff rate was observed on wet' to 'a high runoff rate was observed on the wet'

Response: **We have made the suggested changes**

P6462L28: Delete sentence starting with 'For Soil B...'

Response: **We have made the suggested changes**

P6463L8: Delete first 'and'

Response: **We have made the suggested changes**

P6463L9: Delete 'at the probability levels of $p < 0.0001$ ' and see previous comments regarding defining a significance level throughout.

Response: **We have made the suggested changes**

P6463L10: Here and throughout: it should be 'significance' test

Response: **We have made the suggested changes**

P6463L16: Change to 'an average' (this comment applies to many places in this manuscript where the word 'a' or 'an' has been omitted)

Response: **We have made the suggested changes**

P6463L18: Change 'highly' to 'more'

Response: **We have made the suggested changes**

P6463L22: Put 'an' in front of both 'initially'

Response: **We have put 'an' in front of both 'initially'**

P6464L10: For slope steeper than 25%? Really you only show this for slopes at 45%. Here and throughout, I would avoid the speculation to all slopes higher than 25%.

Response: **We have corrected throughout**

P6464L12: Change 'decreased' to 'decrease'

Response: **We have made the suggested changes**

P6464L13: Delete 'to be observed'

Response: **We have made the suggested changes**

P6464L14: Delete 'at 45% than at 25%' as this is implied earlier.

Response: **We have made the suggested changes**

P6464L16: Delete 'level of'

Response: **We have made the suggested changes**

P6464L19 'rate of increment'? This does not make sense. Re-write.

Response: **We have rewritten the sentence**

P6464L23: Change to 'the air-dry treatment'

Response: **We have made the suggested changes**

P6464L27: 'availability of high runoff rate'? This does not make sense. Re-write.

Response: **We have re-written the sentence**

P6465L4: Change to 'more detached'

Response: **We have made the suggested changes**

P6465L7: Here and elsewhere: Change 'than at' to 'relative to'. This is because you are talking about something compared to something else.

Response: **We have made the suggested changes**

P6465L10 'the probably reason for this soil'? This statement sounds awkward.

Response: **We have changed and modified the statement.**

P6465L18: Delete 'than at 25%' and 'at 45% than at 25%'

Response: **We have made the suggested changes**

P6465L20: Change 'was to 'were'

Response: **We have made the suggested changes**

P6465L29-P6466L6: This section is confusing and needs rewritten. You have not introduce these percentages well nor labeled them with % signs.

Response: **We have rewritten the section**

P6466L5: Here and elsewhere: Delete the r and p values as you have them listed in the main text. Just reference the table (which should move to supplemental material).

Response: **We have made the suggested changes**

P6466L16: Delete sentence starting with 'Correlation coefficients...'

Response: **We have deleted the sentence**

P6466L20: Change to 'decrease'

Response: **We have made the suggested changes**

P6466L26: Here and everywhere: it should read either 'significant difference' or 'significantly different' as appropriate per sentence construction. Fix these!

Response: **We have fixed these**

P6467L2: Change to 'the highest'

Response: **We have made the suggested changes**

P6467L3: Delete sentence starting with 'For Soil A...'

Response: **We have deleted the sentence**

P6467L9: Change to 'rather than'

Response: **We have made the suggested changes**

P6467L14: again, remove 'numerically' as it is implied.

Response: **We have removed the word 'numerically'**

P6467L17: Be aware of the significant figures on your percentages. Are you sure there are 2 decimal places?

Response: [We have reconsidered and made changes on the significant figures](#)

P6467L24: Change 'has somewhat relations with' to 'is somewhat related to'

Response: **We have made the suggested changes**

P6468L18: Rename this subsection to reflect it is the section where you are applying the models.

Response: **We have renamed this section**

P6468L19-24: This section will improve if you reference the equation numbers (see previous comments). Currently it is poorly written.

Response: **We have made the suggested changes**

P6468L26: Delete 'although most b-values were between 0.95 and 1.75'

Response: **We have made the suggested changes**

P6468L27: Delete 'to'

Response: **We have made the suggested changes**

P6469L5: Change 'The author reported that' to 'Reported'

Response; **We have made the suggested changes**

P6469L9: Change 'transport; for soil A, the result' to 'transport. For Soil A, the results'. Note here and everywhere you need to be consistent with either Soil A or soil A in your naming.

Response: **We have made the suggested changes**

P6469L20: again, remove 'numerically' as it is implied.

Response: **We have made the suggested changes**

P6469L21: change to 'depending'

Response: **We have made the suggested changes**

P6469L29: Change 'a coefficient' to 'coefficients of'

Response: **We have made the suggested changes**

P6470L1: again, remove 'numerically' as it is implied.

Response: **We have made the suggested changes**

P6470L8: Delete this sub-section heading (3.6) as it is not needed.

Response: **We have deleted**

P6470L18: Change 'Especially, these models (model V and IV) are well' to 'These models are especially well'

Response: **We have made the suggested changes**

P6471L3: Change 'indicated' to 'indicates'. Be careful of verb tenses.

Response: **We have made the suggested changes**

P6471L4: Change 'least' to 'lowest'

Response: **We have made the suggested changes**

P6471L5: Delete 'except for Soil bat 45% increase in moisture content reduced erodibility of soils'

Response: **We have made the suggested changes**

P6471L8: Delete 'almost'

Response: **We have made the suggested changes**

P6471L16: change 'than for' to 'relative to'

Response: **We have made the suggested changes**

P6471L21: Change 'soil not mean that' to 'soil does not mean'

Response: **We have made the suggested changes**

P6471L24-25: It should either be 'soils were' or 'soil was'. Pick a convention and use it consistently.

Response: **we have made the suggested changes**

P6472L1: Delete 'works have'

Response: **we have deleted**

P6472L8: Change 'thereof' to 'thereafter'

Response: **We have made the suggested changes**

P6472L13: Put parenthesis around citation data and change 'decreased' to 'decrease'

Response: **we have made the suggested changes**

P6472L22: Remove 'set for'

Response: **We have removed it**

P6472L24: Perhaps 'independently' is more correct than 'unconnectedly' here?

Response: **we have made the suggested changes** as per the suggestion

P6472L29: I think you want to structure this as 'limiting conditions'. Consider it here and throughout.

Response: **we have structured it**

P6473L5: Delete 'and poor correlation coefficient was obtained for Soil C'

Response: **We have made the suggested changes**

P6473L11-13: Consider the following rewrite: 'In general, the effect is positive for low slopes. For steeper slopes, the effect can be either positive or negative depending on the soil type and the actual processes taking place.'

Response: **We have modified it**

P6473L13: Change 'limiting condition slope' to 'slope as a limiting condition'

Response: **We have made the suggested changes**

P6473L14: Consider the following rewrite for the sentence starting with 'However':

'However, for transport limiting conditions, soils that have high infiltration capacity (such as Soil B) may have negative effects of slope steepness.'

Response: **We have made the suggested changes**

Figure 1: This figure needs cleaned up. It is unclear in the legend which line is which treatment

Response: **We have cleaned up the figure and made the legend clear**

Reviewer #2

General Comments:

This is an interesting paper on the effects of antecedent moisture conditions and slope on soil erosion, splash and runoff rates, especially since there is very little research on soil erosion for soils from this area. The research is of good and the data is interesting but the paper suffers from a lack of detail about the methods and experiments. In addition, some of the results are overstated. The results of the 45% slope experiments are sometimes interpreted as the effects of slopes larger than 25%, even though the results are for only one slope larger than 25%. To show the effects of slopes larger than 25%, more experiments should have been done (e.g. also at 30, 40, and 60% slopes). It would be better to state that the results for the 45% slope experiments are different or show a different trend and to describe how they are different rather than saying that there is a different trend for slopes larger than 25%. Some of the tables should be combined to one larger table and the text should be improved. I suggest that the authors proof-read the paper in more detail or have it proof-read by a native English speaker.

Specific major Comments:

Comment: P6454L1-6: Give more information on the rainfall simulator. How was the rainfall intensity determined? How variable was the rainfall intensity? Do you have any information on the spatial distribution of the rainfall? Do you have any information on the raindrop kinetic energy?

Response: **We have added more information about the calibration of the rainfall simulator in the main manuscript. Table has been added in the Supplemental Material section that shows the different aperture, disc speed and pressure combination and rainfall intensity as well as uniformity coefficient for each combination**

Comment: P6454L16: More information is needed on the preparation of the soil. How was a similar bulk density or soil porosity ensured for the different experiments? How was the soil surface leveled?

Response: **More information about the preparation of the soil is added in the manuscript. The amount of soil that was added in the erosion pan was measured layer by layer and equal mass of soil was added and at average bulk density of 1.67 gm was maintained.**

Comment: P6461L1-2: The variation in the amount of rainfall intercepted by the different slopes is not negligible and should thus be taken into account!! A slope of 9% intercepts 99% of the water compared to a flat surface. A slope of 25% only 91%, and most importantly a slope of 45% only 71%. Thus there is an almost 30% difference in the amount of water intercepted by the low slope experiments and the high slope experiments. This is not a negligible amount! The numbers presented in this section should be interpreted based on the different amounts of intercepted water, e.g. a large part of the runoff reduction from 51 to 37 mm/hr on P6462L3-5 or the change in runoff on P6463I2 could be explained by the smaller capture area of the larger slope. It is important to give the runoff ratios as well as the runoff amounts.

Response: **I think the reviewer made error in calculation of the percent of interception. For all of the slope steepness the variation in interception is less than 9% and relative to the result this has no still significant impact. For the 45% the reduction in rainfall capture is about 9 % ($\cos(\tan^{-1}(0.45))$)**

Comment: Be careful how the results are presented and discussed. In order not to overstate the results, the results of the 45% slope experiments should not be interpreted as the results for all slopes larger than 25% and the change for the 45% slope should not be interpreted as the change that occurs after a 25% slope threshold has been reached. Carefully reread all results sections and rewrite to avoid overstating the results (see general Comments as well).

Response: **The reviewer brings up a good point and we have made correction in all sections as per the Comments.**

Comment: P6467 – section 3.4: Calculate the enrichment factors or present the size fractions as ratios (fraction of the eroded or splashed sediment: fraction in the original soil). That way it is a lot easier to understand what these numbers mean and whether splash or erosion was enriched or depleted in certain size fractions. Some of the literature that shows that the eroded sediment is enriched in smaller particles should be referenced as well.

Response: **It is a good Comment: and we have tried to present the splash and washed sediment distribution together which may help for comparison. Since the original soil material particle size distribution is also presented in Table 1 readers may easily be able to compare the splashed, washed as well as the parent soil particle size distribution.**

Comment: P6449L21-22: Deposition happens continuously during the erosion process even if the transport capacity is not exceeded. Subsequent re-detachment continues to move the soil particles (see for example the description of the soil erosion process in the Hairsine and Rose model). Rewrite this section so that it is clearer that deposition and re-detachment both occur during the erosion process.

Response: **We have made the suggested changes**

Comment: P6450L17-18: Theta, b, c, and a are not in equation 2. Move the description of these parameters to the place where they are used (P6451).

Comment: P6451L5: Intensity and slope are already included in I, p, S, and q so theoretically K_c should not depend on rainfall intensity or slope. Fix or explain why it does and give references.

Response: **Some what the Comment is correct, however, the K_i value in most models is usually considered as erodibility and this parameter changes with change in eroding agent for this specific model (rainfall intensity) and the amount of soil loss. Since the idea is taken from literatures we have added references.**

Comment: P6452L21: Give reference

We have made the suggested changes

Comment: P6453L18: Describe how variable the rainfall is. How much more rainfall falls in these 6 months?

Response: **We have added information in the manuscript**

Comment: P6454L14: How long? Several years or several decades?

Response: **Detail has been explained in the text and the soil was treated for more than ten years**

Comment: P6455L14: So the soil was near saturated? This is different from what previous papers have termed 'prewetted' (eg. Francis and Cruse, 1983 and Benjamin and Cruse, 1983). Explicitly mention this difference.

Response: **The term prewetting indicates only the soil has water content above air dry in the time of simulation. The initial moisture content may vary from research to research, however, in this research the simulation was carried out when the soil reached at field capacity.**

Comment: P6455L17: Explicitly mention how many experiments were done.

Response: **We explicitly mentioned the total experiments that had been conducted. There were 72 experimental simulations.**

Comment: P6455L17-21: Reword this section. It is not clear as the entire sequence is already given on L19.

Response: **We have made the suggested changes**

Comment: P6455L24: Sometimes erosion rates decrease a lot with additional rainfall. The peak sediment concentrations occur early during an event, while later in an event much lower 'steady state' concentrations are measured. Reword this sentence. Also, it would add to the paper if you would show a graph with sediment concentrations as a function of time throughout a 'storm' sequence. After all, you collected 5-min data but only show and discuss totals.

Response: **We have modified the statement and we have added detail explanation on the data collection and posted sediment yield rainfall intensity variation in the Supplemental Material Section.**

Comment: P6456L14: Explain which equation was used

Response: **We have explained the equation that was used in the manuscript**

Comment: P6557I3Response: section 2.2.9: This section should be significantly shortened given that these models are already described on p6450-6452. References could be made to the equations on those pages rather than discussing them again.

Response: **We have made the suggested changes and the models have been described only in the introduction part and references have been made to the equations**

Comment: P6557I5: How were these models fitted to the data? Maximum R2, minimum sum of squared errors?

Response: **Runoff and sediment yield data for each rainfall intensity simulation was collected and the slope steepness factor was calculated based on the equation given in the manuscript. Using these parameters regression analysis was carried out. Detail have been described in the main manuscript about the fitting procedure**

Comment: P6459L10: The organic matter content should already be given in the description of the soils on P6454.

Response: **we have made the suggested changes**

Comment: P6461L1-10: Better explain why the depths of ponding would be so different for the different experiments. Is this in part related to the soil surface preparation or did the depth change the way you would expect it to change (based on the runoff, slope, similar roughness)? Did different experiments have a different surface roughness? Did rills develop?

Response: **The sentence on this part was not clear. The phrase “depth of ponding” has been replaced by “depth of runoff” and the mean depth of runoff has been added in Table 3 in the main manuscript**

Comment: P6461L4: Insert reference (e.g., Proffitt, A.P.B., Rose, C.W., Hairsine, P.B., 1991. Rainfall detachment and deposition: experiments with low slopes and significant water depths. Soil Sci. Soc. Am. J. 55, 325–332).

Response: **we have inserted reference on the effect of flow depth on splash detachment.**

Comment: P6464L28: Explain why flow depth is unlikely to cause this.

Response: **The reason for flow depth is unlikely to cause the result has been explained in the manuscript and the flow depth at different slope steepness has been added in Table 3 in the main manuscript**

Comment: P6464I29: Calculate the streampower to show this. You have all data to calculate it.

Response: **The Reviewer raised good point and we have calculated the stream power and the result is presented in Table 3 in the main manuscript.**

Comment: P6468I1-8: Insert references to previous studies that have shown that eroded soil is enriched in smaller particles and depleted in larger particles.

Response: **We have added references to previous studies and explained interrill erosion is size selective which means it is enriched in smaller particles.**

Comment: P6470I16: K values did not vary that much with slope steepness, except for Model IV for soil A with dry conditions

Response: **Even though the K values looks like similar statistically they are different**

Comment: P6471I1: Be specific. Give the model numbers here (models III and V).

Response: **We have made the suggested changes**

Comment: Table 1: Give the particle size boundaries as well

Response: **we have considered the Comment**

Comment: Table 3 and 5: Explain what 'SEM' and 'LSD' stand for. Also check that the numbers have the appropriate number of decimal

Response: **We have explained**

Comment: Merge table 2, 4, and 6 into one larger table.

Response: **We have merged**

Comment: Merge table 5 and 7 into one larger table

Response: **We have merged**

Comment: Table 8 and 9: It would be more useful to give the enrichment ratios (fraction in size class in splash or wash divided by the fraction in the original soil) or at least to give this in parentheses after the actual numbers. Also check the number of appropriate significant figures.

Response: **We have presented both splashed and washed sediment size in the same table using parenthesis for comparison and adding the ratio may take more places and need more table. We have made the suggested changes in the significant figures**

Comment: Figure 1: Redraw this figure with a more intuitive set of line colors and line types (e.g. all experiments with wet soils in solid lines and all experiments with dry soils in dashed lines and the three slopes in different colors or with different symbols).

Response: **We have made the suggested changes**

Note that these are some of the suggestions to improve the readability of the paper. I recommend having the paper proof-read by a native English speaker.

Response: **Thank you for the Comments and we have made significant modification and improved the quality of the manuscript.**

Comment: P6448L5: replace 'The' by 'This'

Response: **We have made the suggested changes**

Comment: P6448L9: insert 'rainfall with a' after 'simulated'

Response: **We have made the suggested changes**

Comment: P6449L6: insert 'the' after 'defined as'

Response: **We have made the suggested changes**

Comment: P6449L10: insert 'on' before 'steep' and replace 'have' by 'has'

Response: **We have made the suggested changes**

Comment: P6449L12: remove 'an'

Response: **We have made the suggested changes**

Comment: P6449L13: replace 'and in turn, it needs' by 'This in turn requires' (otherwise the sentence is too long which makes it hard to read).

Response: **We have made the suggested changes**

Comment: P6449L26: replace 'an area' by 'areas'

Response: **We have made the suggested changes**

Comment: P6449L28: replace 'affects' by 'affect the'

Response: **We have made the suggested changes**

Comment: P6450L5: replace 'varies' by 'vary'

Response: **We have made the suggested changes**

Comment: P6450L6: insert 'rainfall' before 'intensity'

Response: **We have made the suggested changes**

Comment: P6450L8: replace 'rain' by 'rainfall'

Response: **We have made the suggested changes**

Comment: P6450L9: replace 'mostly' by 'can be'

Response: **We have made the suggested changes**

Comment: P6451L4: replace 'P' by 'p'

Response: **We have made the suggested changes**

Comment: P6451L5: replace 'intensity' by 'rainfall intensity'

Response: **We have made the suggested changes**

Comment: P6451L7: replace 'model' by 'models'

Response: **We have made the suggested changes**

Comment: P6451L14: remove 'also'

Response: **We have made the suggested changes**

Comment: P6451L18: insert 'the' before 'interrill'

Response: **We have made the suggested changes**

Comment: P6452L2: replace 'zero. . .cent' by '0-30%'

Response: **We have made the suggested changes**

Comment: P6452L7: replace 'assumed' by 'assume'

Response: **We have made the suggested changes**

Comment: P6452L9: replace 'relationship' by 'relationships'

Response: **We have made the suggested changes**

Comment: P6452L10: replace 'is' by 'are'

Response: **We have made the suggested changes**

Comment: P6452L23: insert 'an' before 'increase' (twice).

Response: **We have made the suggested changes**

Comment: P6452L26: replace 'measures' by 'measure'

Response: **We have made the suggested changes**

Comment: P6453L1: insert 'is' before 'less'

Response: **We have made the suggested changes**

Comment: P6453L5: replace 'following...proposed' by 'objectives of this work are'

Response: **We have made the suggested changes**

Comment: P6453L7: replace 'using' by 'for', insert 'the' before 'Lake', and replace '(1)' by '(2) to'

Response: **We have made the suggested changes**

Comment: P6453L10: replace '(2)' by '(3)'

Response: **We have made the suggested changes**

Comment: P6453L11: insert '(4) to' before 'determining'

Response: **We have made the suggested changes**

Comment: P6453L17: replace 'its' by 'an'

Response: **We have made the suggested changes**

Comment: P6453L21: replace 'This. . .was' by 'These experiments were'

Response: **We have made the suggested changes**

Comment: P6453L25: remove 'made'

Response: **We have made the suggested changes**

Comment: P6454L1: insert 'the' before 'FEL'

Response: **We have made the suggested changes**

Comment: P6454L22: replace 'effect on' by 'an effect on the'

Response: **We have made the suggested changes**

Comment: P6454L25: replace 'Eventhuogh' by 'Even though'

Response: **We have made the suggested changes**

Comment: P6455L1: insert 'the' before 'pan', 'an' before 'effect' and replace 'concentration (volume)' by 'the volume'

Response: **We have made the suggested changes**

Comment: P6455L2: replace 'has' by 'have an'

Response: **We have made the suggested changes**

Comment: P6455L4: remove 'test area of this'

Response: **We have made the suggested changes**

Comment: P6455L5: replace 'with' by 'and' and 'depth' by 'deep'

Response: **We have made the suggested changes**

Comment: P6455L6: replace 'is' by 'was'

Response: **We have made the suggested changes**

Comment: P6455L8: replace 'Drainage' by 'a drainage'

Response: **We have made the suggested changes**

Comment: P6455L9: replace 'compartments were' by 'compartment'

Response: **We have made the suggested changes**

Comment: P6455L11-12: move this sentence to P6454L10

Response: **We have made the suggested changes**

Comment: P6456L1: replace 'within' by 'at'

Response: **We have made the suggested changes**

Comment: P6456L9: replace 'allowing' by 'different'

Response: **We have made the suggested changes**

Comment: P6456L23: replace 'Using. . .the' by 'The'

Response: **We have made the suggested changes**

Comment: P6457L9: insert 'a' before 'rainfall'

Response: **We have made the suggested changes**

Comment: P6457L16: replace 'assumed. . .2' by 'is assumed to be equal to 2 by various researchers'

Response: **We have made the suggested changes**

Comment: P6457L19: replace 'In this study' by 'For model II'

Response: **We have made the suggested changes**

Comment: P6458L1: replace 'two' by 'II' and 'that' by 'of the'

Response: **We have made the suggested changes**

Comment: P6458L2: insert 'The' before 'Sf' and 'was' after 'that'

Response: **We have made the suggested changes**

Comment: P6458L3: remove 'and. . .as'

Response: **We have made the suggested changes**

Comment: P6458L13: insert 'the' before 'slope'

Response: **We have made the suggested changes**

Comment: P6458L14: remove 'which. . .above'

Response: **We have made the suggested changes**

Comment: P6458L19: replace 'a' by 'the'

Response: **We have made the suggested changes**

Comment: P6458L20: replace 'important particles' by 'large fractions' or something similar

Response: **We have made the suggested changes**

Comment: P6458L24: replace 'a' by 'the'

Response: **We have made the suggested changes**

Comment: P6459L1: replace 'a' by 'the'

Response: **We have made the suggested changes**

Comment: P6459L3: remove 'amount of'

Response: **We have made the suggested changes**

Comment: P6459L4: replace 'values between' by 'from' and 'were' by 'was'

Response: **We have made the suggested changes**

Comment: P6459L5: replace 'varied' by 'different'

Response: **We have made the suggested changes**

Comment: P6459L7-8: rewrite this sentence. 'increase strength rapidly with time' is not very clear.

Response: **We have made the suggested changes**

Comment: P6459L12: replace 'better' by 'a stronger'

Response: **We have made the suggested changes**

Comment: P6459L20: replace 'indicate' by 'indicates'

Response: **We have made the suggested changes**

Comment: P6459L22: replace 'types' by 'type'

Response: **We have made the suggested changes**

Comment: P6459L26: round numbers so that they have an appropriate number of significant figures

Response: **We have made the suggested changes**

Comment: P6459L28: replace 'had' by 'have'

Response: **We have made the suggested changes**

Comment: P6460L2: insert 'rapid' before 'aggregate' and remove 'rapidly'

Response: **We have made the suggested changes**

Comment: P6460L7: replace 'at each level of' by 'and'

Response: **We have made the suggested changes**

Comment: P6460L8: remove 'the'

Response: **We have made the suggested changes**

Comment: P6460L9: remove 'were'

Response: **We have made the suggested changes**

Comment: P6460L12: remove 'steeper' and replace 'steepness greater' by 'steeper'

Response: **We have made the suggested changes**

Comment: P6460L17-20: remove this sentence. It is double.

Response: **We have made the suggested changes**

Comment: P6460L21: replace 'decreasing' by 'decrease'

Response: **We have made the suggested changes**

Comment: P6460L27: replace 'Different' by 'A difference'

Response: **We have made the suggested changes**

Comment: P6461L2-6: replace 'pounding' by 'ponding'

Response: **We have changed depth of ponding to flow depth**

Comment: P6461L6: remove the first 'less'

Response: **We have made the suggested changes**

Comment: P6461L19: replace 'reduce' by 'reduces'

Response: **We have made the suggested changes**

Comment: P6461L21: remove 'than the others'

Response: **We have made the suggested changes**

Comment: P6461L22: replace 'of high sealing' by 'a surface seal'

Response: **We have made the suggested changes**

Comment: P6461L24: insert 'for' after 'strength'

Response: **We have made the suggested changes**

Comment: P6461L26: remove 'was' and replace 'containing' by 'having a' and replace 'particle' by 'fraction'

Response: **We have made the suggested changes**

Comment: P6462L17: insert 'likely' before 'due'

Response: **We have made the suggested changes**

Comment: P6462I22: replace 'within the levels' by 'as a function of'

Response: **We have made the suggested changes**

Comment: P6462I1-5 and I26-30: merge these sections as they have the same information.

Response: **We have made the suggested changes**

Comment: P6463I9: remove 'at the probability levels of' and put 'p<00001' in parentheses

Response: **We have made the suggested changes**

Comment: P6463I15: remove 'amount of' and insert 'yield' after 'sediment'

Response: **We have made the suggested changes**

Comment: P6463I16: remove 'however. . . .0.57Kgm-2hr-1'

Response: **We have made the suggested changes**

Comment: P6463118: replace 'highly' by 'more'

Response: **We have made the suggested changes**

Comment: P6463119: insert 'the' before 'combined'

Response: **We have made the suggested changes**

Comment: P6463121: remove 'was' and place 'varied' before 'significantly'

Response: **We have made the suggested changes**

Comment: P6463128: remove 'the'

Response: **We have made the suggested changes**

Comment: P646411: replace 'were' by 'was', 'from' by 'for' and 'than' by 'compared to'

Response: **We have made the suggested changes**

Comment: P646419: insert 'a' before 'lower'

Response: **We have made the suggested changes**

Comment: P6464110: replace 'Even' by 'Even though'

Response: **We have made the suggested changes**

Comment: P6464111: replace 'works indicated' by 'studies found'

Response: **We have made the suggested changes**

Comment: P6464122: replace 'For. . .yield' by 'but'

Response: **We have made the suggested changes**

Comment: P6464127: remove 'availability of'

Response: **We have made the suggested changes**

Comment: P6464128: replace 'may. . .probable' by 'unlikely the main'

Response: **We have made the suggested changes**

Comment: P6465L4: replace 'high' by 'more'

Response: **We have made the suggested changes**

Comment: P6465L16: insert 'likely' after 'was'

Response: **We have made the suggested changes**

Comment: P6465L18: insert 'likely' after 'was' and replace 'low' by 'lower'

Response: **We have made the suggested changes**

Comment: P6465L20: insert 'likely' after 'were'

Response: **We have made the suggested changes**

Comment: P6465L23: replace 'less' by 'lower'

Response: **We have made the suggested changes**

Comment: P6466I2: replace 'slight' by 'slightly' and 'decrease' by 'decreased'

Response: **We have made the suggested changes**

Comment: P6466I3: remove 'was'

Response: **We have made the suggested changes**

Comment: P6466I5: replace 'increase' by 'increased'

Response: **We have made the suggested changes**

Comment: P6466I7: remove parentheses.

Response: **We have made the suggested changes**

Comment: P6466I11: move 'mean' after 'necessarily'

Response: **We have made the suggested changes**

Comment: P6466I15: insert 'a' before 'better'

Response: **We have made the suggested changes**

Comment: P6466I23: move 'in. . . .detachment' to P6466I22 before 'When'

Response: **We have made the suggested changes**

Comment: P6466I26: replace 'different' by 'difference'

Response: **We have made the suggested changes**

Comment: P6467I2: insert ', the' before 'highest'

Response: **We have made the suggested changes**

Comment: P646716: replace 'basic' by 'dominant'

Response: **We have made the suggested changes**

Comment: P646714: replace 'sediments' by 'sediment' and remove 'were numerically'

Response: **We have made the suggested changes**

Comment: P646715: remove 'average size'

Response: **We have made the suggested changes**

Comment: P646716: remove 'enclosed'

Response: **We have made the suggested changes**

Comment: P646724: replace 'has some what relations with' by 'is related to'

Response: **We have made the suggested changes**

Comment: P646725 and l2: replace 'highly enriched' by 'high'

Response: **We have made the suggested changes**

Comment: P646727: replace 'deficient with' by 'low in'

Response: **We have made the suggested changes**

Comment: P646814 and l6: remove 'highly'

Response: **We have made the suggested changes**

Comment: P646815 and l7: replace 'deficient' by 'low'

Response: **We have made the suggested changes**

Comment: P646810: replace 'at' by 'on' and remove parentheses

Response: **We have made the suggested changes**

Comment: P646811: replace 'from' by 'in'

Response: **We have made the suggested changes**

Comment: P646814: remove 'were'

Response: **We have made the suggested changes**

Comment: P646815: replace 'varied' by 'different'

Response: **We have made the suggested changes**

Comment: P6468119: replace 'capability' by 'validity'

Response: **We have made the suggested changes**

Comment: P6468120: replace 'combinations' by 'combination'

Response: **We have made the suggested changes**

Comment: P6468121: insert 'exponent' before 'b', remove 'was' and replace 'between' by 'for'

Response: **We have made the suggested changes**

Comment: P645917: replace 'to be' by 'was'

Response: **We have made the suggested changes**

Comment: P6459113: insert 'The' before 'Effect'

Response: **We have made the suggested changes**

Comment: P646115: remove 'at. . .however' and insert ', except for the 25% slope' after 'treatments On P6456116.

Response: **We have made the suggested changes**

Comment: P6469116: replace 'Similarly for' by 'For'

Response: **We have made the suggested changes**

Comment: P6469122: insert 'also' before 'determined'

Response: **We have made the suggested changes**

Comment: P6469124: remove the sentence 'At. . .contents'

Response: **We have made the suggested changes**

Comment: P6469130: insert that this is for 'soil B'

Response: **We have made the suggested changes**

Comment: P6470110: replace 'q' by 'Q'

Response: **We have made the suggested changes**

Comment: P6470112L: insert 'the' before 'same'

Response: **We have made the suggested changes**

Comment: P6470I13: replace 'Model V' by 'Model IV'? replace 'prove' by 'proofs' and 'means' by 'for'

Response: **We have made the suggested changes**

Comment: P6470I15: remove 'were'

Response: **We have made the suggested changes**

Comment: P6470I18-19: replace 'are. . . .slope' by 'fitted data for the 45% slope well'

Response: **We have made the suggested changes**

Comment: P6470I24: remove 'were'

Response: **We have made the suggested changes**

Comment: P6471I4: replace 'least' by 'lowest'

Response: **We have made the suggested changes**

Comment: P6471I5: insert 'an' before 'increase'

Response: **We have made the suggested changes**

Comment: P6471I7: insert 'the' before 'variation'

Response: **We have made the suggested changes**

Comment: P6471I8: replace 'almost for' by 'For'

Response: **We have made the suggested changes**

Comment: P6471I12-13: rewrite this sentence. It is not clear and not a good enough introduction for the conclusion section of this research.

Response: **We have made the suggested changes**

Comment: P6471I15 and I16: replace 'high' by 'higher'

Response: **We have made the suggested changes**

Comment: P6471I15: replace 'low' by 'lower' and insert 'The' before 'Effect'

Response: **We have made the suggested changes**

Comment: P6471I18: put 'more than 33%' in parentheses.

Response: **We have made the suggested changes**

Comment: P6471I21: insert 'may' before 'not' and remove 'that'

Response: **We have made the suggested changes**

Comment: P6471I23: replace 'contents' by 'content'

Response: **We have made the suggested changes**

Comment: P6472I1: insert 'the' before 'runoff rate' and replace 'works have' by 'has'

Response: **We have made the suggested changes**

Comment: P6472I3-5: rewrite this sentence

Response: **We have made the suggested changes**

Comment: P6472I10: replace 'the' by 'this' and put 'more than 25%' in parentheses

Response: **We have made the suggested changes**

Comment: P6472I12: replace 'past experiences' by 'previous studies'

Response: **We have made the suggested changes**

Comment: P6472I16: put parenthesis before '1975' rather than before 'Foster'

Response: **We have made the suggested changes**

Comment: P6472I17: insert 'only' before 'detachment'

Response: **We have made the suggested changes**

Comment: P6472I20: replace 'transporting' by 'transport' and insert 'The' before 'magnitude'

Response: **We have made the suggested changes**

Comment: P6472I22: remove 'set for' and insert 'the' after 'between'

Response: **We have made the suggested changes**

Comment: P6472I24: replace 'unconnectedly' by 'independently'

Response: **We have made the suggested changes**

Comment: P647226: replace 'However for' by 'For'

Response: **We have made the suggested changes**

Comment: P6472128: insert 'to sediment yield' after 'proportion' and 'the' before 'detachment'

Response: **We have made the suggested changes**

Comment: P647315: insert 'a' before 'poor' and remove 'coefficient'

Response: **We have made the suggested changes**

Comment: P647316: remove comma

Response: **We have made the suggested changes**

Comment: P6473113: remove 'actual. . .place'

Response: **We have made the suggested changes**

Comment: P6473114: remove 'means' and put 'for soils. . .B) in parentheses

Response: **We have made the suggested changes**

Comment: P6473116: remove the first 'steeper' and 'slope'

Response: **We have made the suggested changes**

Comment: Table 1: replace 'sand sand' by 'Medium sand'

Response: **We have made the suggested changes**

Comment: Caption table 2: replace 'types' by type'

Response: **We have made the suggested changes**

Comment: Caption table 3: remove 'and levels' and replace 'contents' by 'content'

Response: **We have made the suggested changes**

Comment: Caption table 4: remove 'levels'

Response: **We have made the suggested changes**

Comment: Caption table 5: remove 'and levels' and replace 'types' by type'

Response: **We have made the suggested changes**

Comment: Caption table 6: remove 'and levels'

Response: **We have made the suggested changes**

Comment: Caption table 7: remove 'and levels' and include in the first row the headings for the different soil types so that it is clear what the different columns are

Response: **We have made the suggested changes**

Comment: Table 10: replace 'Probability level' by 'p-value', 'Vs' by 'vs' and 'moistures' by 'moisture'. Also this table could be removed as it would be easy to include these numbers in the text.

Response: **We have made the suggested changes**

Comment: Table 11: the numbers all have a different number of significant figures. Please check.

Response: **We have made the suggested changes**

Comment: Table 12: replace 'Kg S' by 'Kg s' and insert that these models are models III and V respectively.

Response: **We have made the suggested changes**

Comment: Figure 1 legend: redo the legend. 'Soil A-dry' is shorter and easier to understand than Wash

Response: **We have made the suggested changes**

Comment: Figure 1 caption: replace 'contents' by 'content'

Response: **We have made the suggested changes**

Reviewer #3

The authors conducted pan experiments under a rainfall simulator to assess the interaction among multiple variables on splash detachment and interrill sediment yield. These variables included soil type, slope, and antecedent wetness conditions. Runoff was also evaluated; runoff was considered both in terms of the influence of the above variables but also as a variable that in itself can influence erosion. Based on the abstract, erosion models that included both rainfall intensity and runoff provided a better fit than erosion models that only considered rainfall intensity. Additionally, there were a number of interactive effects dependent on the specific combinations of variables. The experiments appear to be useful in light of the limited information on erosion processes in the region.

However, there are two key areas that require further explanation in the text:

1. As a primary concern, it seems quite important to suitably answer why runoff decreases so dramatically at higher slopes. There is a particular need to separate whether this decreased runoff is a real outcome of steeper slopes or – more importantly – to demonstrate that it is not some artifact of the experimental set-up that may call into question other conclusions.

Response: The experimental set up had no any problem on the result. The reason for reduction in runoff at 45% slope in the experiment has been described in the manuscript. Such reduction in runoff at steep slopes had been also reported by other researchers. The most important reason for reduction in runoff in all of the research results is the dynamic change in soil properties during rainfall event because of various reasons such as slaking and sealing effects

Reviewer #2 correctly states that changing slopes would decrease the amount of rainfall capture, but I think the impact is overstated. For a 45_ slope, capture would be only 71% of a flat surface, but for a 45% slope (0.45 unit rise for 1 unit run), I calculate that capture would be 91% of a flat surface. Declines in runoff between 25% and 45% slopes are more than this 9% change in most cases. Especially in the pre-wetted trials, there would be minimal soil water storage available, so runoff rates should remain nearly the same across trials with varying slopes unless there is some subsoil flow (I see soils are supported on 90 mm of gravel in the trays and there is mention of a drainage outlet).

Response: As you stated the maximum reduction in the amount of rainfall capture was less than 9% ($\cos(\tan^{-1}(0.45))$) and this has no significant impact relative to the amount of runoff variation observed in the research. The 90mm gravel was added to simulate the natural condition under lab research and there is no subsurface flow; to understand more about the erosion pan it is better to see the figures posted on the Supplemental Material section.

If there is sizable subsoil flow in the gravel, it is important to clarify that the trays are not necessarily representative of actual field conditions and that the correlation between slope and runoff generation is only relevant to the experimental set-up. Furthermore, if there is subsoil flow in the experiment, given that runoff may be a dominant variable in sediment yield, it would be

important to indicate that the relationship between sediment yield and runoff may be transferable to the field scale but that sediment yield and slope may not be (given the complicating interaction between slope and runoff in the experimental set-up). Overall, I think the authors should be hesitant to make any general conclusions regarding slope in the paper if it does appear slope has an impact on runoff that would not scale to field conditions.

Response: There is no subsurface flow under such laboratory research (please see the figure in the supplemental material section) and this will not be the reason for the reduction in runoff under 45% slope. The reason for reduction in runoff at 45% slope is described in the manuscript.

Comment: There needs to be more explanation of what data was fitted to the models and how the models were fitted (minimizing least squares error?). Presumably, in fitting a model such as Model I, sediment yield would be measured over each 15-minute storm interval and plotted against the corresponding intensity during that storm, but this needs to be explicitly stated. It would be ideal to also provide a figure of the yield vs intensity data and the best-fit lines for the different models for several different sets of factors (e.g. Soil Type A, 9% slope, prewetted; Soil Type A, 9% slope, dry; etc.). Also, it seems that the authors should be more careful in considering which model is most suitable. For all models, the R² is often very high with only several isolated exceptions that tend to fall under Model I or II (e.g. prewetted, Soil C, 45% slope –R²= 0.60). It would be enlightening to consider why these isolated failures in certain models occur instead of simply saying Model V always gives consistently good R² values. Particularly since the models do not use the exact same input data (some use intensity only; some use intensity and discharge; some use intensity, discharge, and slope) there is the possibility that Models III, IV, and V simply have some ability to compensate for possible errors in the expected intensity by also being weighted by another factor. If anything, the authors should consider whether there is really enough evidence to demonstrate that any model is better or if in fact when fitted, all models appear to be suitable in most cases.

Response: The reviewer raised good points. In the model evaluation section as you stated the sediment yield variation at different rainfall intensity data are required and for more information and to clarify for the readers we have added sediment yield variation at different rainfall intensity in the supplemental material section. The model evaluation section had two major important objectives: 1. To test the hypothesis that erosion models give the same erodibility value at different slope steepness and moisture content 2. To compare the runoff-rainfall and the rainfall based interrill models. As per the result the models give various erodibility values even though they were expected to provide same erodibility value. Moreover, the runoff-rainfall type models give somewhat similar erodibility values and better estimation than the rainfall intensity based model.

Comment: Finally, as noted by the other reviewers, the paper does need further grammatical editing and could also benefit from additional conciseness to make the manuscript more readable. The other reviewers have already provided numerous editorial suggestions, and I will not attempt to replicate their sizable efforts.

Response: We have made significant change in the manuscript write up and considered the comments given by other reviewers

Reviewer #4

Interrill erosion, runoff and sediment size distribution as affected by slope steepness and antecedent moisture content Research Paper

Dear Editor Dr. Tammo Steenhuis

Now I am able to inform that I revised the paper above. The paper is original and provides good data obtained from experiment lab concerning to splash erosion in Ethiopia. Also, the topic would call the attention of HESS readers. There are, however, some aspects of the study that could be clarified and the general quality of the written text could be improved improve significantly before this manuscript can be accepted for publication in HESS. I would recommend that the authors perform major revisions to this manuscript.

The paper reports an experiment conducted in laboratory to check the interrelationships of sub-processes related to soil erosion. The study was a four factorial experiment in a complete randomized design with two replications of each combination. The variables under consideration are: slope steepness, antecedent soil moisture, splash, infiltration and runoff. The soils used in the experiments are from Lake Alemaya watershed, Ethiopia. The authors also sought to assess traditional models for predicting soil erosion and tested the hypothesis concerning to slope steepness used on interrill erosion model; also the authors sought to determine the erodibility of the soil (K). There is an overwhelming attempt to explain the result based on physical behavior of the variables under consideration (ex. stream power, shear stress, flow velocity and flow depth). But none hydraulics parameters were measured. In other words, some interpretations (results) cannot be explained by the experimental context. Even so, the authors sought explanations for the experimental variations based on literature review. The experiment is empirical based, so that physical causal explanations are fraught with difficulties since the data/results are restricted to the experimental context. I suggest that the authors try to restrict their explanations based on data obtained in the experiments in order to prevent speculation (see comments bellow). I suggest that the authors before they display the erosion models they could clarify a little more about the interrill erosion (physical mechanism) in order to support further discussion about the results.

Response: We thank you for the valuable comments you provided us. The comments are important to improve the quality of the manuscript and we have incorporated almost all the comments in the text. Moreover, we have added more information about some hydraulic parameters and have significantly modified the manuscript write up.

Comment: Erosion Processes is composed by Detachment, Transport, Deposition so the author should use in some places just soil loss instead of soil erosion. P1 1.1-2 – Soil erosion is a three-phase process consisting detachment, transport and deposition. Keep the process similar to P 3 1.18-19.

Response: **We have made the suggested changes**

Comment: P1 1.9 Rainfall intensity at 120mm/hr change for Rainfall intensity at 120 mm/h.

Response: We have accepted the suggestion and have made a change

Comment: P1 1.11 change Alemaya Black soil to Vertisols,

Response: **We have made the suggested changes**

Comment: 2.2.2 section P 3 1.5 These quotes are old (Hurni, 1985 and Constable, 1985) if possible look for more current literature sources.

Response: **this comment is somewhat correct and these are old references but since they have basic information about the area, we still have added these references**

Comment: P 3 1.27 over land flow change by overland flow.

Response: **We have made the suggested changes**

Comment: P 4 1.1 topography change by slope.

Response: **We have made the suggested changes**

Comment: P 4 1.18 b, a, and c are fitted constants. These constants are not displayed on the equation 2.

Response: **We have made the suggested changes**

Comment: P.4 1. 25-26 If “S” equal a second should be “s” (m/S replace by m/s)

Response: **We have made the suggested changes**

Comment: Methodology I suggest the Soils as 2.1; and the study area should be included in the description area of the soil sampling since the authors did not have specifically a study area. The topics of methodology are very fragmented; the authors could try to group them in fewer items.

Response: **We have restructured this part and have made changes**

Comment: P8 Section 2.2.1 provides the characteristics of the rain produced by the simulator (drop size and kinetic energy).

Response: **We have added detail about the rainfall simulator in the main manuscript and in the supplemental material section**

Comment: P 8 1. 25 change to: even though.

Response: **We have made the suggested changes**

Comment: P 10l.15 (2.2.8) How the analysis of variance was performed with just two replications?

Response: **Since the experiment was conducted under controlled condition in laboratory two replications is acceptable. Moreover, it is possible to do completely randomized design ANOVA (Analysis of Variance) at two replications and this does not affect the analysis**

Comment: P12 l. 22-23 (Imeson and Jungerius, 1977) replace by (Imeson and Jungerius, 1977).

Response; **We have made the suggested changes**

Comment: P 12 l. 24-25 Authors should choose $\text{kg m}^{-2} \text{ h}^{-1}$ or $\text{kg/m}^2/\text{hr}$, because we can find in the text different manners of expressing this notation.

Response: **We have made the suggested changes** and maintained consistency

Comment: P 13 l.26 data with very high accuracy 6.581% change to 6.58% (see tables: 3; 5 and 9).

Response: **We have made the suggested changes**

Comment:P 16 l.27 change to: $p=0.0001$ or only $p<0.05$

Response: **We have made the suggested changes**

Comment: P 18. l.13 Lillard et al. (1941) and Neal (1938) Aren't there also more recent studies?

Response: **The reviewer idea is correct, however, these references have been added relative to the objectives of the research and the little works that have been done on such researches**

Comment: P 19 l. 1 erosivity of over land flow change to detachment of the overland flow

Response: **This is somewhat correct; however, there is usually no detachment by overland flow in interrill erosion process. Erosivity is defined as the detachment and/or transport ability of the eroding agent (overland flow/rainfall) and it might be barely equivalent to detachment in the case of rainfall, since transport capacity of rainfall is negligible. In this case we can refer to it as erosivity of rainfall or detachment of rainfall. However, in the case of overland flow, erosivity may indicate the transport and/or the detachment capacity of the flow. Therefore it is technically inappropriate to change the word 'erosivity' to detachment'. Despite this fact, to avoid confusion we have corrected the statement as "erosivity/transport capacity of overland flow..."**

Comment: P7. l.21 The authors assume that: Detachment by surface flow is negligible in interrill soil erosion. . However, the authors claim on page 19 l.1: Slope steepness has the most direct effect on the erosivity (detachment) of over land flow by determining its stream power

(Contradictory). R: Then the authors explain that the increase of sediment yield was due to the detachment caused by overland flow. But it should be negligible.

Response:

The original statement was “slope steepness has the most direct effect on the erosivity of overland flow by determining its stream power.....” When you change the word ‘erosivity’ to ‘detachment’ the statement will have completely other meaning. As we have addressed in the above comment erosivity of overland flow does not necessarily mean detachment of overland flow. Erosivity may be barely equivalent to detachment in the case of rainfall but for overland flow erosivity indicates the detachment and/or transport ability of flow. In the manuscript the word ‘erosivity’ indicates the transport ability of overland flow but not the detachment. Moreover, in this research we did not observe contradictory result, even though observing contradictory result with the hypothesis or assumption is not an error. The proportion of splash transported as sediment yield by runoff (column 7 in Table 3) that is splash value divided by sediment values for all treatment combination was less than 1. These indicate that all the splashed material was not transported by overland flow. This means the process was a transport limited and one may not expect detachment by overland flow from such transport limited process. However, to avoid confusion we have added the phrase ‘transport capacity’ in bracket: ‘slope steepness has the most direct effect on the erosivity/transport capacity of overland flow by determining its stream power.....”

Comment:P.13 1.7 Statement: Soil that is highly susceptible to surface sealing, such as Soil C, increases strength rapidly with time (Bradford and Huang, 1992), resulting in lower splash after a prolonged periods of rain. R: I do not notice much difference in splash of the soils being analyzed (table 2). Was it performed variance analysis to compare the average?

Response: Analysis of variance was carried out as indicated in the methodology part and the two way ANOVA table is posted in the supplemental material section.

Comment: P.15 1.1-9 Statement: Thus, the probable cause for the lower splash detachment at 9% than at 25% was possibly due to depth of water poundings, as evidenced by the runoff rate measured at the two slopes. . . . R: The authors should have measured the depth of flow. It was not informed the drop size produced by the simulator. Also, nothing is said about the surface roughness.

Response: The reviewer raised important point and the mean depth of flow is added in Table 3

Comment: P.15 1.21-23 Statement: The probable reason for the highest runoff observed on Soil C could be the development of high sealing due to clogging effect of silt particles. . . . R: I do not see on Table 2 such differences in the splash, especially between soil B and C.

Response: Sealing occurs not because of the amount of splash material availability rather by the type of splashed material. The more the silt contents the more the chance for sealing.

Comment: P 17 l.1 Surprisingly, for Soil B the mean runoff rate at 45 % slope steepness was much lower than the mean runoff rate at 25% slope steepness. R: Despite such experiment control it could be random variation or experimental error. Therefore, not all explanations are possible. See the splashed material (Soil A, 25% air-dry 5.23 kg m² h) it seems an outlier.

Response: **If the variation is statistically significant it means that it was not a consequence of chance or random variation. Such reduction in runoff at steep slopes may be observed as a result of dynamic change in soil properties during rainfall event because of various reasons such as slaking and sealing effect. In this specific research the reason for reduction in runoff at 45% slope has been explained in the main manuscript.**

Comment: P.17 l.15 Statement: On average the highest amount of sediment was washed out from Soil C. . . (Table 6) R: This is contradictory, since the author's previously statement indicates that the sealing of the topsoil protected against the effects of splash.

Response: **As we indicated in the introduction part, erosion has detachment, transport, and deposition sub-processes. The rate of sediment yield is dependent on the availability of splashed material and the capacity of flow to transport the available material. It is the combined effect of these parameters rather than the individual influences that determine the rate of sediment yield from an area. If you see Table 5 and Table 3 column 7, you may easily get the reason for high sediment yield to be observed on Soil C. Table 3 indicates that there was high mean runoff rate on Soil C as a result significant portion of the available splashed material was transported as sediment yield. In Table 3 column 7 the portion of splashed material transported as sediment yield was high for Soil C than for other soils. Even the highest percentage of splashed material transported as sediment yield (64%/0.64) was observed on Soil C. Therefore, contradictory result had not been reported on this issue**

Comment: P.18 l.28 The possible reason may be the higher stream power available at 25% slope steepness than at 9%...and others causes R: I partially agree with this statement since the stream power discharge is an important element, not only the slope. So this statement should be valid for 45% slope, as well. P.19 l. 10. The probable reason for this soil may be reduction in raindrop impact due to high flow depth. . . R: I have not seen any depth flow measurement to support this explanation. This effect can occur, however, there is an important change in hydraulic conditions of the flow (i.e increases the transport of particles). (See Bryan 2000, Geomorphology 32, 2000, 385–415)

Response: **The reviewer raised good points and we have added stream power as well as depth information on Table 3 as per the Referee #2 suggestion. As indicated by different researchers and as you stated in the comment above, stream power has relation with transport capacity of flow and in interrill erosion since overland flow is size selective the type of particle transported is also depends on the available transport capacity/stream power.**

Comment: P. 20 l. 21 . for Soil B may be due to the decreased in runoff rate as slope increased (due to less transport capacity of the transporting agent with increase in slope steepness). Previously (P.18 l.28) the authors claim: The possible reason may be the higher stream power available at 25% slope steepness than at 9%. R: Before the slope was the main factor of increasing stream power.

Response: **It was not to say stream power decrease with slope steepness rather it was to show as runoff rate decrease stream power would also decreases. To transfer the idea clearly, we have made modification on this statement.**

Comment: Conclusion Authors should address its findings straightforward responding to the proposed objectives. For example, the best prediction model appears clearly in the abstract, but not at the conclusions. (P2 l. 24 Interrill erosion models that include runoff and rainfall intensity parameters were a better fit for these data than the rainfall intensity based model). Also, should be addressed; how this study can assist in actions against land degradation in Ethiopia (at least briefly).

Response: **We have accepted your comment and have modified the write up of the manuscript accordingly.**

Reviewer # 5

General comments:

This study conducted the rainfall simulation experiment for three types of soil in Ethiopia and investigated the effect of slope angle and antecedent moisture on interrill erosion processes. This manuscript includes experimental data seemed to be of good quality and useful, to interpret the interrill erosion processes and evaluate the previous models. However, it was really too hard for the reviewer to understand the manuscript, because of poorly organized manuscript, too many tables and unsuitable figures. Throughout the manuscript, there are many grammatical errors in English, prolonged sentences, and repeated descriptions of same explanation. In the methodology section, too many sections and poor description also made the reviewer in confusion and hard to understand what the authors want to do. In addition, the “Results and discussion” had also too many sections and was poorly organized and prolonged. The evaluation of previous models was based on the statistical analysis, but the description of basic information and data setting for statistical analysis were not sufficient. Some parts of “results and discussion” stated only results, and needs description based on the data and comparison to the literature with critical and scientific discussion. In the “conclusion”, also prolonged, the contents include something like discussion and did not summarize and conclude this study. The authors should be strongly recommended to re-organize the manuscript, especially the methodology section, to divide the “results and discussion” section into the different sections of “results” and “discussion”, and to make the conclusion more concisely. The reviewer strongly recommends the re-organized manuscript to be proofread by native English researcher, before acceptance for publication.

Response: Thank you for your valuable comments and we have made significant improvement in the quality of the paper in all sections. We have included almost all of your comments in the main manuscript.

Specific comments:

[Introduction]

Comment: The authors should be strongly recommended to simplify and re-organize the description, especially about the model description, which could be stated in the methodology and/or discussion sections. This prolonged introduction could make the readers in confuse and hard to understand.

Response: We have made changes in this section.

[Methodology]

Comment: The methodology has too many sections to be understood. The material and methods should be organized well. This section would be better to be composed of 3 parts, which are the site description, experimental design and analysis. The section of “2.2 Experimental design” has too many parts. They should be divided into the two parts of experiment and analysis, and should be stated concisely.

Response: We have restructured and made changes

Comment: 2.1 Description of the study area: In this section, more detail description had better to be added, such the location and characters of the study site (or, sample collection site) as latitude, longitude, geomorphology, geology and landuse.

Response: We have added more information about the study area relative to the objectives of the study

Comment: The sections of 2.2.1 and 2.2.3 can be compiled as the description of rainfall simulation equipment.

Response: We have made the suggested changes

Comment: P6454L2: The company, type, city and country of the company should be expressed in the sentence which introduced the rotating disc type rainfall simulator.

Response: We have added more information about the simulator as per the objective of the study and picture is posted in the supplemental material section.

Comment: 2.2.1 and 2.2.3: Figure of Rainfall simulator and soil pan would be needed to let the reader understand the design of experiment equipment and sampling collection. Figures 3 and 4 are hard to be understood.

Response: More figures have been added in the supplemental material section

Comment: 2.2.3: Though the authors indicated the problem associated with edge and size effects of plot scale experiment, but did not refer the reason why the design of Bradford and Foster (1996) had been applied in this study. Furthermore, as the design of soil erosion pan was not indicated in the figure, the reader cannot understand where the splash-detached sediment comes from, target area or buffer zone, and what the soil buffer of the pan is for. If the design of soil erosion pan is indicated in the figure, it can help the readers to understand the experiment and following results and discussion.

Response: We have added more information in the main manuscript and figures are added in the supplemental material section

Comment: 2.2.4: The experimental design and setting are pretty hard to be understood. Why the authors conducted the rainfall simulation in two sequences? The reviewer could not understand the experimental design of rainfall simulation, sequences and the timing of sample collection, mainly due to the grammatical error and lack of adequate explanation of Mayer (1981) to be cited. The authors should be strongly recommended to explain the experimental design and its objective clearly and concisely. The use of table would help the authors to make clear explanation.

Response: More information on the experimental design is added in the manuscript and the importance of simulation of rainfall in two sequences is also described.

Comment: 2.2.5: Did the authors measure the splash detachment only in the first sequence, or both? These 5 minutes-interval samples seemed to be evaluated and could not be found in “results and discussion”. How did the authors treat them in the analysis?

Response: Splash, runoff, and sediment yield data were collected for both sequences of rainfall intensities. The data were collected in 15 minutes-intervals and the results were aggregated for the total 90 minutes simulation run.

Comment: 2.2.7: More detail information is needed about the measurement of shear strength and erodibility.

Response: we have explained in detail how shear strength data were taken and erodibility was calculated in the manuscript

Comment: 2.2.8: What is two replications? If the authors conducted the measurement of each experiment setting with two replications, the description should be stated in the explanation of experimental design. The reviewer could not find which data and how many samples were used for the statistical analysis.

Response: We have explained in detail in the manuscript

Comment: 2.2.8 and 2.2.9 can be compiled in the section of “analysis” and stated more concisely.

[Results and discussion]

Response: We have made the suggested changes

Comment: 3.1: P6458L27: How did the authors evaluate the state and degree of “aggregated”? The description about the definition of the aggregate degree and stability in this study would be needed.

Response: We have added more data in table 2

Comment: 3.1: P6459L7–18: In this paragraph, the description based on the data seemed to be not adequate.

Response: We have made the suggested changes

Comment: 3.1: P6459L23-28 “increased resistance by 20.81%”: How was the resistance to aggregate breakdown evaluated, or calculated? What data was based on? It should be stated in the methodology section.

Response: the result is explained based on the data given in table 3

Comment: 3.1: P6460L18-P6461L9: The description of results was hard to be understood. Furthermore, the results were neither compared to literature nor discussed here scientifically.

Response: We have made the sentence clearer

Comment: 3.2: P6461L12: Why did the authors evaluate only the last three 15-min sampling periods for runoff rate?

Response: Not only runoff but also splash as well as sediment yield data were taken at the end of 15 minutes for each rainfall intensity application and the results were aggregated for the 90 minutes simulation.

Comment: 3.3: P6463L5-12: Where should the reader find the data described in this part? Please state the referred table or figure.

Response: We have made the suggested changes

Comment: 3.3: P6463L14: “Soil B at 25%” -> “Soil B at 45%” is correct?

Response: It was error and we have made a change

Comment: 3.3: P6463L21: In Table 7, what does each column of the upper line indicate? Explanation is necessary for upper lines to be understood.

Response:

Comment: 3.3: P6463L23: “decreased erodibility of Soil A by 48.6%” How is the erodibility and its decrease evaluated?

Response: the result was evaluated based on the sediment yield data described in Table 3

Comment: 3.3: P6463L29-P6464L3: What does the “percentage of splash transported in overland flow” mean? Can the reviewer find the results somewhere in the figure or table?

Response: It is described in Table 3, column 7

Comment: 3.3: Table 10 is not conspicuous. This type of results is usually stated in the matrix of correlation coefficient with asterisks denoting significance level between parameters.

Response: We have made a change

Comment: 3.3: P6467L5-9: The reviewer wonders if only the results from the statistical analysis can attribute the limiting process or not. Scientific discussion is necessary for this.

Response: We have discussed the result based on the data runoff, splash and sediment yield data described in Table 3

Comment: 3.4: P6467L24: What is “the availability of these particles in the original soil materials”?

Response: The original soil particle material is described in Table 1

Comment: 3.4: P6468L8-17: The explanation and Table 9 were hard to be understood. The figure would be more useful to explain what the authors want to explain.

Response: We have made modification on this part

Comment: 3.5: P6469L13-14: The grammar of this sentence is wrong. Table 2 maybe better to be referred?

Response: We have made the suggested changes

Comment:3.5: P6469L15: What is the “effect”?

Response: We have made a change and explained in detail and clearly.

Comment: 3.6 and 3.7: What were the findings the authors want to show? No scientific discussion was found in [these sections](#).

Response: In section 3.6 we have explained the result of the model evaluation based on the results given in Table 8. In this section we compared especially the rainfall intensity based model with the rainfall intensity-runoff type models. In section 3.7 the erodibility values for the three soils were calculated and the result was discussed based on Table 9 results. This may provide important scientific information about the currently available interrill erosion models and also about the erodibility of the study area major soils.

[Conclusion]

Comment: 4.: P6472L12-P6473L17: The conclusion of this manuscript was not sufficiently summarized and concluded and hard to be understood. The contents stated in the “Conclusion” of present manuscript like a general discussion. The authors should be recommended to rewrite the conclusion concisely.

Response: We have made changes based on yours and other referee comments.