**********

*The following documents the comments from the editors/reviewers and the response made by the authors to the comments one by one. The comments from the editors/reviewers are displayed in black, while the response made by the authors are shown in blue.*

**********

Dear Dr. Wang,

C#1：Thank you for the submission of the revised version of your manuscript.

You replied to most comments by the reviewers in a comprehensive manner and addressed the criticized aspects and implemented suggested improvements.

When reading the revised version, I still noticed some linguistic issues such as a number of very long sentences that are better split in two or formulations that may be misleading. I annotated your track-changes documents with a number of such observations for suggesting improvements.

Response: Thank you for the suggestions/comments to our manuscript. We really appreciate the time and energy the editors have invested in our manuscript. We have revised our manuscript by taking into account the suggestions/comments raised by the editors/reviewers. We hope that the changes made improved our paper and the quality of our manuscript meets the requirement of the journal.

C#2 There is one remaining issue related to the results and their interpretation. This is the question of how the different sampling regimes during the two periods might have affected your findings. Despite the fact that you discuss that aspect and provide qualitative arguments why you expect the methodological effect to be small, I am not fully satisfied and think you have not yet fully explored the possibilities to get some detailed insights. Given the fact that you have a more advanced sampling regime for the second period, your SRC according to Eq. [3] should yield a fairly accurate representation of Period II. This SRC allows to calculate a theoretical, predicted sediment concentration time series for Period II (based on the continuous discharge data). Knowing the sampling scheme of Period I, you can resample in a Monte Carlo fashion this theoretical concentration time series and derive the respective SRC.

Of course, this is not a full substitute for measured data during Period I at higher frequencies, but such a resampling allows for a consistent assessment evaluation of what could have been observed during Period II. Such a quantitative estimate of the effect of the sampling schemes is important (as highlighted by Rev. 1) especially given the situation that your loads are dominated by a few events (8 events in Period II, 25 in Period I). With grab sampling these events will be often only poorly covered and therefore it is essential to know to the best possible degree whether the sampling has an impact on the resulting SRCs.

Response: We agree with this comment. We have changed the methodology to derive

sediment loads. We are now using a combination of SRC together with the continuous flow data that are available for both periods. This has the advantage of being more stable with respect to different sampling scheme frequencies (Thomas, 1988; Syvitski et al., 2000; Desilets et al., 2007; Sheridan et al., 2011). Thus, we have revised the respective section (2.3.2 Sediment regime analysis) in the manuscript. We became aware that the information on availability of high resolution flow data for both periods may have not been indicated sufficiently. We have therefore slightly modified section '2.2 Data availability' to make this clear. As a result, the calculated sediment loads for Period I changed from around 11 t $yr^{-1}$ to around 6 t $yr^{-1}$.

For Period II we followed the suggestion of the reviewer and carried out a resampling. Considering that Period II has a finer-resolution dataset, we resampled the dataset of Period II (random selection of the same number of samples as available in Period I, which was then repeated 10 times) and compared the results between the original data set (number of samples n= 5175) and the resampled data set (number of samples n= 935 ) of Period II.
We fitted a sediment rating curve for each resampled data set and then estimated sediment load for Period II by combining the resampled SRC with the continuously available flow data. We found that the mean annual sediment load of Period II, derived from the resampling with adapted numbers of sampling points ($62.4 \pm 10.2$ ton.$yr^{-1}$) was not significantly different from our original calculations ($60.0 \pm 140.0$ ton.$yr^{-1}$). Although this is a rough analysis based on only 10 resamplings, the results suggest that an altered sampling frequency has no significant influence on sediment load in our case study.
We added this information to section '4.2 Potential interference of different sampling methods'.

C#3 Please have a look at my comments in the annotated manuscript and incorporate the re-sampling results to back up (or modify) your findings and their interpretation.

Response: Thanks for all of the valuable comments and suggestions, which, we believe, are greatly beneficial to improving our manuscript. We have revised the long sentences annotated in the manuscript. We also followed the other suggestions and made responses to the comments one by one as follows.

C#4 Line 37 "theparcel"?
Response: we have changed to "the parcel".

C#5 Line 65, "Zhang et al. (2021) quantitatively evaluated..." So climate change reduced erosion risk? What kind of land use change had happened? Without such information, the following numbers are not informative.
Response: Thank you for the question. We have revised the expression as "Zhang et al. (2021) quantitatively evaluated the contributions of the decrease in annual rainfall erosivity, the decrease in arable land and bare land, and the construction of silt trap

dams to the reduction of sediment load of a typical Loess watershed". (Please see line 67 in the revised manuscipt)

C#6 Line 70, "management practices had a greater impact on erosion than climate change" Again, the information is too limited.
Response: We have changed it as "They found that the conservational management practices had a greater impact on reducing soil erosion rates than forecasted effects of climate change (i.e. the decrease in rainfall amounts in erosion sensitive months)". (Please see line 73 in the revised manuscript)

C#7 Line 76-83. Long sentence.
Response: Thanks you for pointing this out. We have rephrased these lines. (Please see line 80-85 in the revised manuscript)

C#8 Line 101-104: Could also be split into two sentences.
Response: Thank you for pointing this out. We have split these sentences into two.(Please see line 106-111 in the revised manuscript)

C#9 Line 111, State already here that these sediment measurements were carried out only during specific periods. As written, the text gives the impression that there is a continuous observational data set (triggering comments such as by rev. 2).
Response: we have revised it as "have been monitored in the HOAL catchment from 1945 to 1954 and from 2000 to now" (Please see line 119 in the revised manuscript). We have also added the word 'periodically' into the section 'Abstract' to make this clear. Additionally we have added some sentences into the section '2.2 Data availability' as follows:

"A data set of discharge and sediment concentration was available for the period 1945-1954. After that, measurements were stopped and started again in 1990. Therefore, data records for the period 1946-1954 (Period I) and 2002-2017 (Period II) were used for this analysis."

C#10 Line 115,You use the term land use with different meanings in the same sentence. Define clearly what the term means and use it in a consistent manner throughout the manuscript.
Response: We are grateful for this comment. We went thoroughly through the manuscript and replaced as much of the 'land use' 'land cover' wording with the term LUCC. We recognized that we did not define the terminology properly so far. Therefore, we added sentences to define LUCC to the section 'Introduction' as follows:
'In our analysis, we evaluate the relative roles of climate change, LUCC and the change of land structure on sediment production. We define LUCC as a change in either type of land use (i.e. arable land, grassland, forest) or type of land cover

(agricultural management, mainly by crops with different risk of soil erosion).'(Please see line 107-109 in the revised manuscript)

C#11 Line 136: insert periodically
Response: Thank you for pointing this out. We have inserted "periodically".

C#12 Line 141-142:This statement should go into the discussion, not the method section. It is irrelevant for understanding what you did.
Response: we have removed the whole sentence, i.e. "To our knowledge, for the time period 1945-1954, almost no sediment concentration data 140 are available in Austria, we therefore think that this database from the HOAL is extremely valuable and relevant for climate impact analysis".

C#13 Line 226-230, Isn't it possible to resample Period II with the sampling scheme of Period I? This would provide additional information how robust the comparison actually is.
Response: We are grateful for this suggestion. We have resampled the dataset of Period II to account for the different amount of samples in Period I, and carried out an analysis to test whether the influence of sampling scheme is relevant when assessing sediment regime in our case study. For detailed explanation we refer to C#2.

C#14 Line 240, What were the covariates you considered?
Response: We carried out this analysis by considering the log-transformed discharge (log_Q) as independent variable, the different periods as the fixed factor (Period), and the log-transformed sediment concentration (log_C) as the dependent variable. This analysis was implemented in SPSS (General linear model---Univariate---model). By examining the interaction effect between the independent variable and the fixed factor, we tested if the slopes of the regression lines of log_C against log_Q were significantly different between the periods. In the revised manuscript, we revised the text as "by ANCOVA analysis with the log-transformed discharge as independent variable".

C#15 Line 360, Can you provide numbers?
Response: We have added the amount of snowfall in the revised manuscript (about 10%).

C#16 Line 403, Parcel density can be skipped: this is redundant information.
Response: We agree that it is a redundant information. However, we think that, it might be easier for the readers to directly know this number without a necessity to calculate it. So, we suggest to keep the text as before.

C#17 Line 468, What is shifted sediment regime? Not clear.
Response: Thanks for the question. According to Asselman (2000), the plot of slope

against intercepts (i.e. a/b) is representative of a sediment regime of a river section or a catchment. The values of the regression coefficients of the sediment rating curves, i.e. *a* and *b*, depend on the erosion severity, the availability of sediment in a certain area, the power of the river to erode and transport the available material, and on the extent to which new sediment sources become available during weather conditions that cause high discharge. High values of the coefficient 'a' occur in areas characterized by intensively weathered materials, which can easily be eroded and transported. The *b* coefficient represents the erosive power of the river (Peters-Kummerly, 1973; Morgan, 1995). Therefore, the shift of sediment regimes means an alteration of either soil erodibility and/or erosive power of the river. The explanation for this shift is indicated in the text directly below figure 6. In the revised manuscript, we indicated this with the addition '(see text below)'.

"According to Asselman (2000), a shift of sediment regime means an alteration of either soil erodibility and/or erosive power of the river. In Figure 6, we found that the regression lines of Periods I to II are different."(Please see line 480 in the revised manuscript).

C#18 Line 475, Effect if sampling method?
Response: We have carried out a resampling analysis, according to the suggestion of the editors/reviewers, to test whether different sampling schemes had effects on sediment load estimation. We found that sediment loads estimation were not different between the resampled data set and the original sampling scheme. For details please see C#2. Therefore, according to the physical meaning of the plot of *a*/*b,* we mainly attributed the shift of the line to the alteration of sediment transport regime, instead of the interference of the sampling schemes.

C#19 Line 573-574, Not convincing: different sampling strategies on non-linear will cause different average concentrations.
Response: We agree that this statement only provides a qualitative argument which is indeed not convincing. To answer this comment, in the revised manuscript we deleted this statement.