Revision of the manuscript on “Scale-breaks of suspended sediment rating in large rivers in Germany induced by organic matter” by Thomas O. Hoffmann et al.

First of all, we thank Kristin Bunte and the anonymous reviewer for their constructive criticism and for taking the time to share their insightful suggestions and comments. Both reviewers do not have a general critic on the manuscript, but made many detailed suggestions how to improve it. Thus, we address their comments in the revised version of the manuscript (including track changes option) and reply to their detailed comments step by step below. For your convenience, we colored our replies to each comment of the reviewers in green letters.

Referee #1: Kristin Bunte

The manuscript presents an interesting study and is well worth publishing in e-surf. Teasing apart the different sedimentary constituents (mineral, organic) that determine rating relation between suspended sediment and discharge is an important contribution. The authors quantify the different components and their change with discharge and provide a model that appears to be applicable to streams in Germany.
The description of the three methods used to compute the breakpoint flow is a bit unclear, a bit more help is needed to enable the reader the follow all steps. More of a problem is that the authors repeatedly refer to a bootstrapping approach, but never explain why bootstrapping is undertaken, what data are used, and what the purpose of the bootstrapping approach is in the first place. This needs to be revised. The manuscript also needs clarifications all over. Most of the issues are minor and can be easily addressed. I have provided a lot of suggestions for the authors when tackling those issues.
The title reflects the topic of the study, and the abstract summarizes the study effectively.
The manuscript is generally well structured. An exception is the discussion Section 4.1 which is weaker than the other chapters. Items in Section 4.1 are discussed one after the other without connection, without introduction, and without a stated course of argument in the beginning.
Use of the English language is fair. The manuscript needs editorial improvement, the majority of which are minor corrections that can be easily addressed.
Several of the figures need improvement; Again, nothing serious, but revision would help to improve the manuscript quality.
In all, my evaluation of the manuscript is: publish with minor revisions, of which there are a lot, but most of them can be addressed in a straightforward way.

We thank Kristin for her very helpful and detailed comments on our manuscript. Before addressing the detailed comments below, we point out that in reaction to the valid criticism raised here, we changed large parts of section 4.1 to ensure a better connection between the aspects discussed therein. Furthermore, we critically reviewed the methods section with

a special emphasis on bootstrapping and sincerely hope that these changes make our manuscript more to the point and easier to follow.

Comments requesting clarification:

L. 15: … identify discharge depended process regimes of suspended matter…. Please define better. Too short - jargon. → rephrased to '…discharge dependent controls of suspended matter.' to avoid jargon.

L 21: …into the first order control of discharge dynamics of suspended sediments. Sounds like jargon. Please start more clearly. → rephrased to '…into the first order control of discharge on the quality and quantity of suspended sediments.' to avoid jargon.

L 63: Please define more clearly which Q is meant. Instant Q? Mean daily Q? → basically, a whole range of "Q" can be used depending on the approach and available data. We added a phrase explaining this: … "Rating curves plot SSC as a function of water discharge Q, while the temporal aggregation (or resolution) depends on the approach and available data and ranges from 15 minutes to annual averages."

L 77: The authors get too involved in describing their plot. I think I know what the authors mean, but I think they could describe this better. SR: A first look at the plot of measured values of SSC vs Q in which data are not segregates by time or processes controlling SSC exhibits strong scatter. → we rephrased the sentence.

L 80: The authors might add that changing water supply or flow hydraulics could also be at play. → we added flow hydraulics because changing water supply is associated with changing Q and changing water sources.

L 86: The authors should add as a 4th item to the list the effects of organic material on SSC that were introduced earlier. Doing so would also give the authors the opportunity to create a connection to the thought starting in line 86 which, as written, appears out of context. SR: Recently, we have learned more about the effects of organic material on SSC, but so far, "Most monitoring studies… → We did not add a 4th item but used the SR to build a bridge between both paragraphs.

L101: Please clarify: Do the "daily" discharge measurements reflect once-a-day instantaneous measurements or are daily averages computed from or continuous measurements of Q and SSC? → We agree that more detailed infos on the measurements is needed, but not at this place. Thus, we deleted the word daily in this line and extended the description in chapter 2.2.

L 116: Here, we selected….Please explain the reasoning for the selection → done, we added more information.

L 123: …SSC was given… do you mean "computed" → yes, rephrased

L 128: (e.g., medium and finer clays?) → rephrased

L 158: It would help a reader if the authors could explain how they arrived at those units for the a-coefficient → done, given the additional information the reader should be able to reproduce the dimension analysis to highlight the dependency between a and b.

L 168: A comparison of Eq. 1 and 2 at one or two stations would be interesting. Does the steepness of the fitted rating relation change after the transformation in Eq. 2? If not, please say so. If yes, please document the change. → the steepness of the fitted relation does not change, we provide more information in the text accordingly.

L 172-179: I find this description a bit hard to follow. Could the authors provide a graphical description/explanation for their computation? → This part was strongly restructured. We hope that it is easy easier to follow now.

L 185: This comes out of the blue with no explanation. Could the authors please explain WHY bootstrapping? What values are bootstrapped and why? → We strongly rephrased this paragraph to give more insights into the WHY.
L 193: ….see Fig. 3 **a**? → done
L 195 (Fig. 3**b**?) → done
L 197: clustering around 1? Don't quite agree. Either give a range (between 1 and 1.3) or a value, perhaps 1.2. → rephrased to give the range of the first and third quantile.
L 198: …clustering around 1: don't quite agree with the statement. I'd say: …. Breakpoints of many stations are slightly higher than the geometric mean discharge → adopted accordingly
L 200: "peaks around 0..." I'd say Fig. 4 indicates that it's > 0. Why not be more specific right away: … peaks near 0.14? → done
L 205: "The differences…." Sentence sounds off as written. Lowland rivers, by definition, have less relief in their catchments. Reword this sentence such that it does not sound like stating the obvious. The term "topography" is vague, too. Is SSC larger because of a steeper channel gradient at the sampling site or due to steeper gradients in the headwater catchments? → we deleted the sentence and rephrased the paragraph!
L 208: …are characterized… sounds vague. What about indicating a direct causal relation and say "generate" → done
L 211: Fig. 7 **a** → done
L 215: …whether the rating for SSC for these two stations → done
Consider that an international reader is not aware that the Moselle joins the Rhine in Koblenz. Please reword accordingly. → it was already state in chapter 2.2. that both rivers join in Koblenz. However, we repeated it here.
L 213-216: Those two sentences could be improved. The authors approach the situation with a mindset of: we had a problem and then we solved it. Please try to reword with a standpoint "from above". Also, as written, I would expect a comparison between sites that were sampled weekly and those sampled daily. Instead the reader is shown two sites with seemingly no connection to Koblenz (mind the international reader).
Perhaps something like: A comparison between …. and ….showed that there was not systematic change in bl and bh due to the frequency of sampling. → rephrased as suggested
L 216-218: sentence is off. Place a period after …. And 1.54+- for **the** Moselle). Those values are similar…
Also: the Rhine and the Moselle → rephrased
L 219: 1000 at each station or at both stations together? → rephrased
L 220: The authors need to explain the what, where, and why of their bootstrap approach! → now explained in detail earlier in chapter 2.
L 221: The LOI -measurements…. An introductory sentence is needed here. The authors just compared the Moselle and the Rhein against other streams. Now the authors seem to compare between the Moselle and the Rhein. → rephrased
L 223: …higher LOI values during the summer months… Please show the reader where in Fig. 8 g+h that is to be seen. Sorry, the color plot shows it. → ok, nothing to correct ;-)
L 241: "…characterized…" vague statement. What about: attributed? Or caused? → rephrased to 'attributed'
L 242: "A positive rating exponent…" It is useful that the authors point to this difference in the exponents of SSC and Qs. However, this statement appears a bit suddenly. Please provide an introductory sentence. → this part is rephrased to avoid breaks in the argumentation.

L. 245: “This implies…” Sentence is poorly worded. “additional sediment sources”: external? Channel bed erosion? → reworded, additional sources are not specific at this stage, however we get back to this term later in the paragraph, indicating that the additional sources are external.
L 247: The authors just switched the discussion from SSC to QS, and I would have expected that the discussion of QS continues, but the authors are switching back to SSC. Eq. 3 and its explanation is interesting, but it appears that this point is only “squeezed in” and interrupts the thread of arguments. Please smooth → the switch is needed to argue that “additional sediment sources” need to be mobilized, this does not follow from SSC alone.
L. 248: …explained by the increasing…… the reasoning of increasing connectivity and increasing area of water-saturated soils seems to be converted: increase in saturated area causes increase in connectivity. → rephrased
L 257: Interestingly, ….An introductory sentence before diving into rating curves from the Elbe and Oder would be useful. → done
L. 261: If “reactivity” means that the flow either carries more sed. from its headwaters or pick it up from the channel bed, more explanation than “drier climate” is needed for why the Elbe and Oder do not do so. Typically, drier areas are considered to have less dense vegetation cover and therefore generate more sediment. Perhaps the authors might turn to geological conditions: Sandstone in the Thuringia Forest and glacio-fluvial deposits along Elbe and Oder may be more porous and generate less runoff than the schists in mountains and highlands along the Rhein and in central west Germany. Perhaps also consider other factors influencing runoff and sediment generation such as land use (percent urban area vs. agriculture) or number of barrages per river mile….? A detailed discussion of the causes might not be the focus of this paper. It is ok to say so, but offering an unsupported statement about the effects of a drier climate on SSC and its relation to Q is not satisfactory. → We are thankful for this suggestion on the importance of soil-saturation. We added the differences of soil porosity, after highlighting the importance of soil-moisture as a controlling factor of hillslope connectivity.
L 264-268: The authors explain that QBr is x times QGM and x times Qavg. Why is knowing this difference important? → We added the median discharge as well. We make the link to Qavg and Qmed since this is much more familiar to geoscientist and hydrologists than the geometric mean. Furthermore the median discharge allows to link the duration a river spends in the low flow and high flow regime.
L 274: 1) “Many of the tributary waterways…” The authors turn to a new subject. An introductory sentence is needed, perhaps something pertaining to a assumed relation between reservoir operation, barrages, and a break in the SSC-Q relation. 2) It sounds like the authors are reacting to some instated issue regarding barrages and SSC. Please bring the reader up to speed on that issue. → Here we just intended to support evidence that reservoir operation is not the dominant control, but that the issue is more complicated. We rephrased this paragraph slightly to build a bridge to the preceding paragraph.
L 275-276: What “reservoirs” do the authors refer to? the channel immediately upstream from a barrage or floodable reservoirs in the floodplain that serve to retain flood waters? What are weir shutters and where are they located? How does opening weir shutters prevent damage to barrages? → We basically state ‘Reservoirs upstream of the barrages…’. This should answer the question. However, to avoid confusion, we rephrased the end of this paragraph from ‘reservoir management’ to ‘operation of barrages’. Explaining the engineering details of barrages is certainly not the aim of this paper. For details the reader is referred to Hoffmann et al. (2017).

L 284: The authors should elaborate on the "Therefore". Perhaps something like: Given that the study found this and that, and given that flow management in reservoirs and barrages does not seem to control the SSC-Q relation, …the question remains… → we rephrased this part as suggested and hope to improve the line of argumentation.
L 285: …at average discharge? In the analyses, the authors related Qbr to the fraction of Q/QGM. Here, the discussion continues with Qavg. Why this change? → because most people are not familiar with Q_GM and Q_avg is the more common used metric.
L 305: Suggest switching the second and first part of the argument: While a positive correlation between SSCtot and Q was observed for most of the year, SSCtot related negatively to Q during the low flow months, indicating the effects of dilution of SSCtot as flows just start to increase and a shift in the SSC regime… → rephrased as suggested
L. 310: …decreasing trend of bl (Fig. 6b) Should that be Fig 6a? → correct! We change it to Fig 6a
L 322: Again, what bootstrapping? → bootstrapping is a standard procedure to estimate confidence intervals of regression coefficients, as explained earlier!
L 331 and 360: …breaks slightly above Q/QGM = 1 → done, rephrased as suggested
L 377: water sampling…. Perhaps: water quality sampling? Or SSC sampling? → rephrased

Figures
Fig. 4: Instead of the four colors are not very distinctive and indistinguishable when viewed in black and white. I suggest using different line types. → done
Fig. 6: Please explain the empty circles. → done
Fig. 6: When viewed in black and white, there is no color distinction between north and south. Perhaps use a gray scale or patterned circles. → Translating the colors to gray scale will lose much of the visual information. The colored version will be available open access online! Thus, we intend not to change the colors.
Fig. 7: The small dots with different colors are not well distinguishable, esp. not in b & w. Suggest using different symbols. The x-axis title is not understandable. Suggest: (%*A S>10%*) and explaining %A… in the caption text. → points have now different color AND form. Label of x-axis was renamed as suggested
Fig. 7: The caption could be better worded: SR: Relation between rating coefficients (….) and the fraction of the catchment area with hillslopes steeper than 10% (%*A S>10%*) → rephrased
Fig. 8: In caption, replace "line" by "row", and refer to top row and bottom row. → done
Fig. 9 is overly busy. Considering that the authors do not discus all plotted statistical information (min, max, outliers), I suggest simplifying the plot to improve its readability and emphasize the plots' main points. For Fig. 9a I suggest:
- drawing a curve indicating the median values for each month. Surround that curve with a shading the upper and lower boundaries of which indicate the quartile values.
- Do the same for the second site in Fig. 9a but use a distinctly different color scheme.
- Do the same for Fig. 9b.
- Do the same for the inset plot and place as the third panel, the same size as the other two panels between panels a and b. → It is certainly true that Fig. 9 is quite busy and that not all of the information contained is discussed in detail in the manuscript. However, we are confident that some readers are interested in the full spread of the data. Reducing the data to median and quartile values disguises the extremes and means a loss of information that we want to keep, be it at the expense of readability.

Technical comments

Dear authors: the font size used in this manuscript is annoyingly small!

We are very sorry for that but have to pass this one to Copernicus and their journals. We used the downloadable Word-Template that uses Times New Roman in 10 pt.

SR = suggested rewording

L 10: …of suspened sediment (omit "the") ….. discharge COLLECTED at 62… → done
L 17 ff: SR.. likely results from a change of factors controlling suspension of intrinsic organic matter at low flows to extrinsic sediment supply (including mineral and organic fractions) due to hillslope erosion at high flows. → done
L 21: SR:…and facilitates new insights → done
L 24: SR: Suspended sediment dominates sediment transport → done
L 30: SR: Dynamics of suspended sediment are strongly influenced by sediment → rephrased differently
L 31: SR: Size and density → done
L 32: SR: Size and density of fine suspended particles in → done
L 34: SR: Depending on sediment sources… → done
L 35: SR… topsoil from either hillslopes or → done
L 36 + 40+41 allochthones spelling! → we used the spelling as given
L 42: SR: temperatures, light and high…. → rephrased
L 47: SR: even if light, temperature…. → rephrased
L 52-53: no new paragraph needed → removed the new line
L 57: SR: …in turn, affect transport dynamics → done
L 71: i.e., always followed by a comma → done
L 71: SR: …as proposed by Reid… → done
L 75: Q: use italics → done
L 84: after Asselmann, (2000) SR: as well as combinations of both within one event. → done
L 84: instead of "characteristics": SR: processes affecting a rating relation in a specific case are well known…
L 90: …inorganic particles in sediment rating curves… → done
L 92-93: not sure a new paragraph is needed → we would like to keep it here since we want the hypothesis to start with a new paragraph!
L 94: … behaviours that are SR: "each controlled by different and independent processes." We test this…. → d one
L 114: SR: …waterways is monitored daily using instantaneous water samples (see below) taken manually… → done
L 116: SR: …in 1965 and has accumulated long-term records
L 120: Frings et al → done
L 126: SR: The use of coffee…and facilitates measuring SSC at large numbers → done
L 129 SR: In general, suspended… → done
L 137-139: SR: Biological fluxes, namely…(Chla) have been monitored since 1997 at two sampling sites located immediately…. → done
L 146: SR: …*LOI*, we segregated … → done
L 160: …normalized by the … (….) computed for each station according…. → done
L 165: …linked to the response of SSC to changing discharge → done
L 167: SR: For most gauging stations included in this study, a and b…. → done

L 189: The rating relations for…. → done
L 199: SR: Rating exponents for the….range between → done
L 200: Sentence gets too long. SR: ….Fig 5). SSC decreases as a function… → done
L 203: Fig. 6 shows…. More information could be put into that sentence. SR: Patterns of spatial distribution become apparent (Fig. 6) for the rating coefficients…. → done
L 204: found along the Rhine → done
L 207: SR: …the fraction of hillslopes steeper than 10% in the contributing catchment area Or: the fraction of contributing catchment area stepper than 10% → done
L 213: SR: Considering that water sampling… → this paragraph has been strongly rephrased
L 214: …to daily sampling at the suspended… → dito
L 215: …rating breaks occur at … → done
L 231-232: SR: Higher Chla-values occur only during moderate flows in spring and summer. Chla-values in the Rhine peak in April, and in May at the Moselle (Figs. 8 and 9). → done
L 239: ….Poesen, 2018) and SR: the presence of this process chain is supported by… → done
L 252: SR: Our results show a clear trend of increasing bl and bh as the fractions of steep hillslopes with S>10%) increase, thus confirming the expectation. → done
L 257: SR: Furthermore, our results that show steep rating curves for the Rhine tributaries than the Rhine itself confirm results by Asselmann…. → done
L 259: SR: Assuming similar catchment topographies for a specified percentage of catchment area steeper 10%, the lower SSC generated at high Q in the Elbe and Oder may be attributable to climatic conditions. → partially rephrased
L 271: SR: "…significantly to discharge" SR: runoff. "….but water…" SR: discharge → done
L 272: SR: …from bl to bh likely reflects a change in factors controlling SSC from …. → done
L 285: …show that the contribution of organic suspended matter to total SSC… → done
L 308: SR: …org. fraction of SSC generally adds a… (or: SSC adds a substantial share to SSCtot year round, the rating… → done
L 309: SR: For instance, Hardenbicker et al. 2016 reported for the Elbe that LOI and Chla contributions to SSC increased with distance downstream, and this is reflected in the decrease of bl exponents with distance downstream. → done
L 313: organic-rich streamflows? organic-poor → organic rich!
L 327: The decrease of ….supports → done
L 346: …load is transported → done
L 351: SR: in the case of a substantial contribution of the organic SSC to ……. practice of using → done
L 358: SR: …, but show a distinct → done
L 359: SSC-Qw Q was not denoted as Qw previously. → changed
L 361: SR: …likely a result of a change in controlling…of suspended…. → done
L 363: SR: …catchment) sources → done
L 374: …paper were provided by the suspended…. → done

Anonymous Referee #2

Hoffmann et al. present a new conceptual model that allows to distinguish sediment load into organic and inorganic shares. The authors apply this model to an impressive number of gauging stations where manually sediment concentrations are estimated. Basically, the

authors apply the classical sediment rating curve, though, extend it to account for varying ratios between organic and inorganic constituents. In general, I see the manuscript by Hoffmann et al. as a relevant contribution and, thus, consider it as worth being published in ESurf. → We are thankful for the many good suggestions of reviewer #2. Again, we commented on each suggestion (see text in green letters) and revised the text in most of the cases as suggested.

While reading the manuscript, several concerns and/or suggestions arise:

- The model the authors present is a way to **analyze a static system**. However, the authors mention that the model is also applicable to study river dynamics. I think it is important to highlight, what the authors refer to when analyzing the dynamics. As I understand, the authors restrict dynamics in a spatial mode, i.e. intrinsic vs. extrinsic. What the author don't study, and I think this is important to mention, is the temporal dynamics. As the authors state in the introduction, temporal dynamics may be analyzed using hysteresis loops (among other). Maybe it is too much additional work and maybe beyond the scope of this manuscript: Did the authors looked on the hysteresis loops, too? I think this is important, at least, to be discussed.
  ⇒ We agree with the reviewer that the term 'dynamics' is misleading in our context, since we do not analyze the changes of the rating behavior, nor consider hysteresis curves (which is far beyond the scope of this study). Therefore, we changed the wording (mainly in the introduction) to avoid the expectation that our concept is based on a dynamic (time-variable) approach. We hope that this matches the concerns raised by the reviewer
- The section of the three methods applied to quantify the scale-breaks of suspended sediment is a bit unclear. I am convinced that better explaining the three distinct methods, eventually doing a bit more math, would improve the manuscript. For example, I cannot see how the authors defined the subsets used in the second method, i.e. how do the authors construct the "sequences" of discharge Qi? I am also curious why the authors did not use a change-point detection algorithm and applied a piecewise regression to a lower and higher flow regime. I am not saying that the approach chosen by the authors is "wrong", yet I was just interested in more details on the methods chosen.
  ⇒ Basically, we did a piecewise regression as suggested by the reviewer to detect the change-point between the low and high flow. We hope that the strongly rephrased paragraph avoids any potential confusion.
- The authors considered the geometric mean in their study. Later in the manuscript, they state, however, that the simple average is ~0.8 x the geometric mean (L 269). I am wondering why the authors did not chose a simple average from the very beginning?
  ⇒ If the steepness of the regression line in a scatter plot changes without a change in the mean of the y-values (e.g. the SSC-values), then the lines circulate around the geometric mean of the x-values (see Warrick, 2015). That is the reason why we used the geometric mean to normalize the values and therefore to achieve independence of the regression coefficients a and b. However, we related the Q_gm to the Q_median and Q_avg later on, since these are much more familiar to most geoscientists and hydrologists. Additionally, the median allows to refer to the time the river systems spend in the high flow and low flow regime (50/50).

- Regarding the sampling routine, I was wondering if the same sampling protocol has been applied for both the daily and weekly measurements? Did the sampling involve also depth-integration?
  ⇒ We added some more information regarding the water sampling to clarify the questions of reviewer. We clearly state now, that water sampling was limited to the top 50cm of the water surface. Thus, no depth-integrated sampling was applied.
- The authors explain possible interpretations of the coefficients. Yet, the part around line 159 (MTb L-(1+3b) is not clearly written. Maybe the authors can provide some better explanation to follow their reasoning. → We gave additional information and explanation regarding the units.
- L 178: Therefore, Q values were classified into equally spaced classes at a log-scale. How many classes exactly? → the number of classes was variable (depending on the Q-range); however the width of the classes was constant, we added this info in the text.
- L 150: "Chla was used as a proxy … for biomass dynamics" What do the authors refer to here exactly when mentioning dynamics? Better to use simply load? → we removed the word dynamics and simply state that chla is as proxy of phytoplankton biomass!
- L8: major relevance for sustainable sediment management. What is that exactly and maybe I missed it, but where do the authors consider this in their manuscript? → Indeed, we did not discuss the implications of our results for sustainable sediment management. This introductory sentence aims to motivate the reader to show the general implications why a good understanding of the processes of suspended sediment transport are needed, without aiming to discuss these implications in detail.
- L 44: "Water flow velocities regulate the water residence times, which in turn affect the time for phytoplankton growth in river systems. Low flow conditions with increased residence times provide favorable conditions for phytoplankton growth or even blooms. In contrast, short residence times can strongly reduce the share of autochthonous biomass in suspended sediments, even if light availability, temperature and nutrient levels are not limited (Fischer, 2015; Quiel et al., 2011)." This argument is not completely clear to me. I see the time restrictions for phytoplankton growth given a fast draining river. However, it depends on where you sample, I guess, too. Given high flow velocities, I assume that the concentration of phytoplankton is indeed relatively low in the water column. However, as load is the product of concentration times discharge, the overall phytoplankton load may be high, too. I am not a biologist. Maybe the authors can better explain their thoughts on that and how this may affect the results and findings they present here. → Here we consider mainly the control of (mineral and organic) suspended sediment concentrations and highlight the fact that autochthonous organic matter has a contrasting relationship to discharge compare to allochthonous susp. matter. The effect on the load is discussed in chapter 4.3. We added a sentence to highlight this difference and to show that the focus here is rather on concentration than on load.
- The authors used coffee filter and stated that the pore diameters of 0.7 to 1 µm. How was this number determined? → This was done in an earlier study of our sediment lab (published in German only). This study compared grain size analysis of suspended sediment before and after filtering. We rephrased the relevant sentence to hint to this approach, but we do not intend to show the results here.
- L 109: Specific discharge. I assume that this is well known to most of the readers. Regardless, I think it would be good to define it here. The same is true for "long-term discharge weighted averages of SSC". Please define this, too. → specific discharge is not

defined. We added a line in chapter 2.2. to inform about the calculation of discharge weighted SSC.

- L 143 ff. The way LOI is explained here is not completely clear. Based on the context, LOI is here defined as the fraction of the total load, i.e. 0-1. However, the authors also write that "The organic component was combusted at 500◦C for 1 hour to estimate the LOI of the suspended matter." This sentence implies a mass involved and, thus, units. Please clarify. See also L 291: "Here we use LOI as a measure of the organic fraction of the total suspended solids." Maybe the latter sentence can be moved into the methods section? → we added a sentence that clearly defines that LOI is give as a fraction of the total SSC: 'In our study LOI is give as the ratio of organic suspended matter to the total SSC.'
- The authors applied the t-test to test the rating coefficients. Are the samples normally distributed and all other requirements met? If not, the t-test is not applicable. → we check for normal distributions. We added some information to the boostrapping, stating that distributions were normal distributed.
- L 194: "For 52 out of 62 stations, SSC - Q rating curves show a distinct break in scaling relation (for examples see Fig. 3) with similar values for Qb estimated from three different approaches (Tab. 2)." Is there any spatial pattern in terms of signal propagation along nested catchments? This would be an interesting finding. → We did not check for the spatial pattern pf the break point. Given the rather narrow distributions of Q_br and the uncertainty related to the estimation of Q_br, we doubt that the differences between stations along a single river channel provides meaningful information. This could however be part of a future paper ;-)
- L 310: "At stations where the organic fraction of the SSC adds a substantial share to the total SSC,. . ." What is substantial? → we added some more information regarding the Moselle where this share is roughly 60% at low flows.
- L 207: "This control is highlighted in Fig. 7, which plots bh with respect to the fraction of the contributing catchment area that is steeper than 10% slope gradient. Catchments with a higher fraction of steep slopes are characterized be higher bh -values." While this finding is somehow expected, I was wondering how the authors decided to choose the 10% value? Why didn't the authors consider all percentiles, i.e. involving the entire topography? 10% sounds a bit arbitrary to me. → The reviewer is correct. 10 % is arbitrarily chosen. However, the result would not change much if another threshold is chosen.
- L 220: "However, the lower number of measurements at the LOI-stations (approx. 1000 at both stations) resulted in a larger uncertainty of the parameter estimation (Δbl and Δbh) from the bootstrap regression". Can the authors somehow quantify the involved uncertainties? → the larger uncertainty results from the larger standard deviation of the distributions of the estimated parameters, as denoted by the terms in the brackets. To clarify this, we changed the word 'uncertainty' with 'standard deviation'
- L 226: "resulting in rating exponents b of −0.51 ± 0.03 and −0.47 ± 0.01 , and a - coefficients of 0.202±0.003 and 0.319±0.006 for the Rhine and the Moselle, respec- tively". Please include b here; It makes the reading a lot easier. → we included b here as suggested
- L 261: "The dry continental climate in the Elbe and Oder catchments likely reduces the reactivity of the river systems, requiring larger increases of rain and discharge to increase the specific sediment supply in these basins compared to basins with higher/more frequent precipitation in the western part of Germany." This is a reason- able interpretation. Yet, can the authors provide a reference? Or can the authors estimate

catchment-averaged rainfall and relate this to the sediment fluxes observed? → Due to the suggestions of Kristin Bunte, we revised this discussion with a stronger focus on soil moisture. Thus, we are not sure if simply annual rainfalls will provide much more information. Certainly, we are not able to give numbers for (antecedent) soil moisture; this is far beyond the scope of the paper.

- L 274: "Thus, the transition from bl to bh is likely to be a result of a change of controlling factors of the suspended sediment from intrinsic (within the river system) to extrinsic (outside the river channel but within the catchment) factors." Well, this is just a personal suggestion: I suggest do avoid intrinsic and extrinsic in this case here: It is a hydrological system, though. Given the catchment scale used here, intrinsic suggest within the catchment and extrinsic from outside the catchment. However, I leave this up to the authors and editors. → The reviewer is correct if we would analyze the holistic sediment budget of a river catchment. However, our main focus here is the river channel. To avoid the complications due to the potentially different views regarding these terms, we defined the meaning of intrinsic and extrinsic within the brackets. We have the feeling that this should avoid any confusion.
- L 353: "In the case of substantial share of the organic SSC to the total SSC, our results suggest that the common practice using a continuous sediment rating results in large errors that can be reduced applying rating relationship including scale breaks." Well, does this really matter if organic transport shares are only important during low flows? I would assume that temporal changes in the sediment rating (hysteresis) might be equally important or even more important. In fact, this study shows that larger fraction of organic matter remains unconsidered during low flows only. → Again, we focus our discussion on the suspended sediment concentration. Indeed, geomorphologist are more concerned about loads and fluxes and the effect of the uncertainty of loads is much smaller than that on concentrations. However, from a biologist point of view, concentrations of organic matter are of great importance for biological processes. Finally, increased suspended concentrations (due to the high organic matter content) at low flow effect the global regression, leading to underestimates of the regressed SSC compared to measured values). We explained these effects on loads by adding an additional sentence at the end of this paragraph.