Review of Hoffmann et al.

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.

Comments requesting clarification:

L. 15: … identify discharge depended process regimes of suspended matter…. Please define better. Too short - jargon.

L 21: …into the first order control of discharge dynamics of
suspended sediments. Sounds like jargon. Please start more clearly.

L 63: Please define more clearly which Q is meant. Instant Q? Mean daily Q?

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.

L 80: The authors might add that changing water supply or flow hydraulics could also be at play.

L 86: The authors should add as a 4^{th} 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…

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?

L 116: Here, we selected….Please explain the reasoning for the selection

L 123: …SSC was given… do you mean "computed"

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

L 158: It would help a reader if the authors could explain how they arrived at those units for the a-coefficient

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.

L 172-179: I find this description a bit hard to follow. Could the authors provide a graphical description/explanation for their computation?

L 185: This comes out of the blue with no explanation. Could the authors please explain WHY bootstrapping? What values are bootstrapped and why?

L 193: ….see Fig. 3 **a**?

L 195 (Fig. 3**b**?)

L 197: clustering around 1? Don't quite agree. Either give a range (between 1 and 1.3) or a value, perhaps 1.2.

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

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?

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?

L 208: …are characterized… sounds vague. What about indicating a direct causal relation and say "generate"

L 211: Fig. 7 **a**

L 215: …whether the rating for SSC for these two stations

Consider that an international reader is not aware that the Moselle joins the Rhine in Koblenz. Please reword accordingly.

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.

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

L 219: 1000 at each station or at both stations together?

L 220: The authors need to explain the what, where, and why of their bootstrap approach!

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.

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.

L 241: "…characterized…" vague statement. What about: attributed? Or caused?

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.

L. 245: "This implies…" Sentence is poorly worded. "additional sediment sources": external? Channel bed erosion?

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

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.

L 257: Interestingly, ….An introductory sentence before diving into rating curves from the Elbe and Oder would be useful.

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.

L 264-268: The authors explain that QBr is x times QGM and x times Qavg. Why is knowing this difference important?

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.

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?

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…

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?

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…

L. 310: …decreasing trend of bl (Fig. 6b) Should that be Fig 6a?

L 322: Again, what bootstrapping?

L 331 and 360: …breaks slightly above Q/QGM = 1

L 377: water sampling…. Perhaps: water quality sampling? Or SSC sampling?

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.

Fig. 6: Please explain the empty circles.

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.

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.

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% (%$A_{S>10\%}$)

Fig. 8: In caption, replace “line” by “row”, and refer to top row and bottom row.

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.

Technical comments

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

SR = suggested rewording

L 10: …of suspened sediment (omit "the") ….. discharge COLLECTED at 62…

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.

L 21: SR:…and facilitates new insights

L 24: SR: Suspended sediment dominates sediment transport

L 30: SR: Dynamics of suspended sediment are strongly influenced by sediment

L 31: SR: Size and density

L 32: SR: Size and density of fine suspended particles in

L 34: SR: Depending on sediment sources…

L 35: SR… topsoil from either hillslopes or

L 36 + 40+41 allochthones spelling!

L 42: SR: temperatures, light and high….

L 47: SR: even if light, temperature….

L 52-53: no new paragraph needed

L 57: SR: …in turn, affect transport dynamics

L 71: i.e., always followed by a comma

L 71: SR: …as proposed by Reid…

L 75: Q: use italics

L 84: after Asselmann, (2000) SR: as well as combinations of both within one event.

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…

L 92-93: not sure a new paragraph is needed

L 94: … behaviours that are SR: "each controlled by different and independent processes." We test this….

L 114: SR: …waterways is monitored daily using instantaneous water samples (see below) taken manually…

L 116: SR: …in 1965 and has accumulated long-term records

L 120: Frings et al

L 126: SR: The use of coffee…and facilitates measuring SSC at large numbers

L 129 SR: In general, suspended…

L 137-139: SR: Biological fluxes, namely…(Chla) have been monitored since 1997 at two sampling sites located immediately….

L 146: SR: …*LOI*, we segregated …

L 160: …normalized by the … (….) computed for each station according….

L 165: …linked to the response of SSC to changing discharge

L 167: SR: For most gauging stations included in this study, a and b….

L 189: The rating relations for….

L 199: SR: Rating exponents for the….range between

L 200: Sentence gets too long. SR: ….Fig 5). SSC decreases as a function…

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….

L 204: found along the Rhine

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%

L 213: SR: Considering that water sampling…

L 214: …to daily sampling at the suspended…

L 215: …rating breaks occur at …

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).

L 239: ….Poesen, 2018) and SR: the presence of this process chain is supported by…

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.

L 257: SR: Furthermore, our results that show steep rating curves for the Rhine tributaries than the Rhine itself confirm results by Asselmann….

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.

L 271: SR: "…significantly to discharge" SR: runoff. "….but water…" SR: discharge

L 272: SR: …from bl to bh likely reflects a change in factors controlling SSC from ….

L 285: …show that the contribution of organic suspended matter to total SSC…

L 308: SR: …org. fraction of SSC <u>generally</u> adds a… (or: SSC adds a substantial share to SSCtot year round, the rating…

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.

L 313: organic-rich streamflows? organic-poor

L 327: The decrease of ….supports

L 346: …load is transported

L 351: SR: in the case of a substantial contribution of the organic SSC to ……. practice of using

L 358: SR: …, but show a distinct

L 359: SSC-Qw Q was not denoted as Qw previously.

L 361: SR: …likely a result of a change in controlling…of suspended….

L 363: SR: …catchment) sources

L 374: …paper were provided by the suspended….