nhess-2020-192 (Pöschmann et al.): Author's Response to Handling Editor

Dear Professor Pinto,

we greatly appreciate the very constructive comments from Referee #2 that helped to clarify remaining problems with the manuscript. We have provided replies to all comments and questions and mostly agreed to change the manuscript as suggested.

The revised manuscript was finally carefully proofread by a native English speaker at our institute. The revision has been approved by all co-authors.

Thank you for your consideration!

Sincerely,

Judith Pöschmann on behalf of all authors

nhess-2020-192: An analysis on temporal scaling behaviour of extreme rainfall of Germany based on radar precipitation QPE data (Pöschmann et al.)

Reply to Referee #2

We thank anonymous referee #2 for his/her detailed comments and suggestions in order to improve our revised draft. We have provided responses to all comments in blue and have updated the manuscript accordingly. All line numbers given in our responses refer to the "old" manuscript with track changes.

Report:

Due to the limited time for this review round, I could only take a look at the revisions of my comments (and not the ones from all reviewers). Since the paper has been modified substantially, there is the possibility that my comments may contradict the ones from the other reviewers.

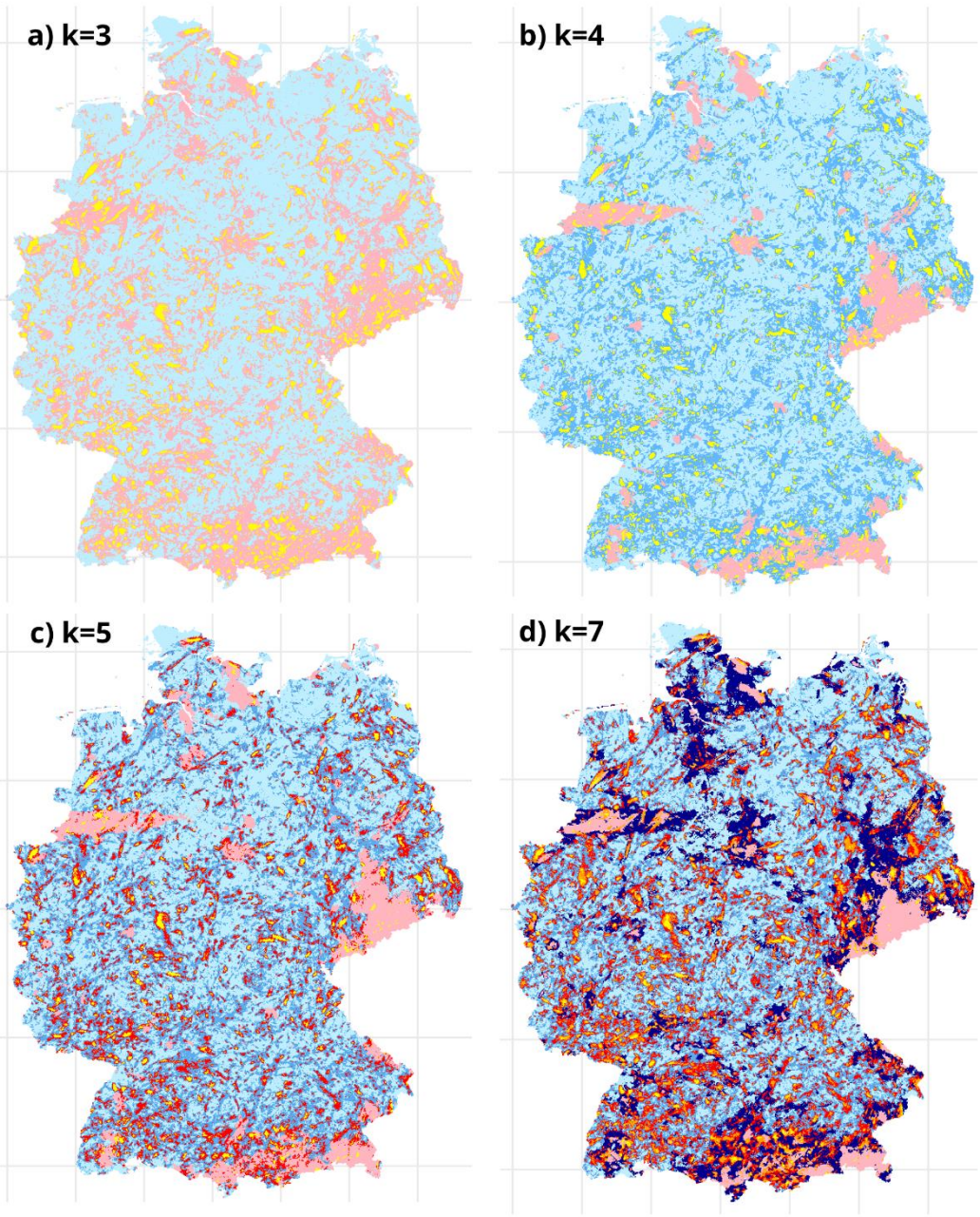
Most of my major concerns from the first round of revisions have been addressed. There are however still two issues that remain

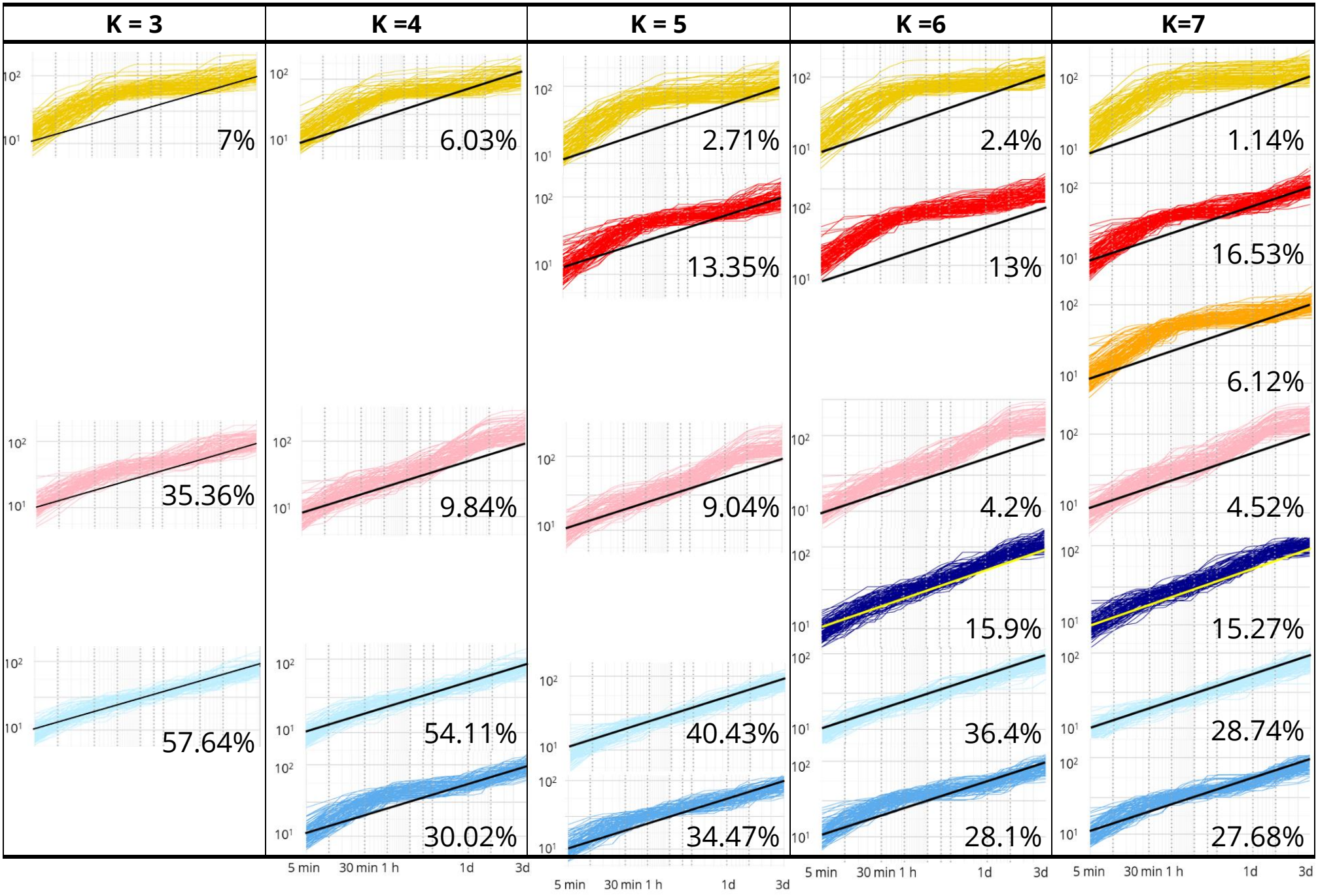
Main Issues

- Clustering: I acknowledge your line of argument that the actual number of clusters is not the main focus when making a point that the scaling can be classified based in the inflections points. And maybe you can justify 6 clusters, but when looking a figure 8 (in the revised manuscript), categories 1 and 2 or 4 and 5 look very similar to me. So why not go with 4 categories instead? The interpretation of the results in section 3.5 is based on those 6 categories but this interpretation may turn out quite different when fewer categories are chosen (more probably won't make any sense). And if a different number of clusters leads to different results and subsequently to a different interpretation that would an issue that needs to be addressed. If not, then it would support the choice of six classes.

Did you look into this and could you comment on this? Maybe a supplement or appendix showing results for different clusters would be an option?

Response: We think it is a good suggestion and added different cluster results as supplement for k = 3, 4, 5 and 7. Find below the maps of the corresponding cluster size as well as the table. As you can see the interpretation of the clustering does not stop making sense when looking at different clusters. The higher the number the more distinguishable results would be possible, but we stopped at a cluster number of six, because it made most sense for us.


a) k=3
b) k=4
c) k=5
d) k=7


K = 3
K =4
K = 5
K =6
K=7
7%
6.03%
2.71%
13.35%
2.4%
13%
1.14%
16.53%
6.12%
35.36%
9.84%
9.04%
4.2%
15.9%
4.52%
15.27%
57.64%
54.11%
30.02%
40.43%
34.47%
36.4%
28.1%
28.74%
27.68%
5 min
30 min
1 h
1d
3d

I still don't understand why you are going into the imputation bridge part. You are definitely correct that an interpolation of NaN does not make any sense in the case of rainfall. But you could justify this simply by stating that there could be e.g. extremes that occurred during a gap (and thus remain undetected) or that an interpolation between two values before and after a gap would lead to false information because you do not know what happened in between. But what is the message you a trying to convey in Figure 2b? A map with maximum values between gaps does not really make sense to me because it is not stated how many gaps there are in total and how long these gaps are. Some statistics about the number and length of these gaps would be more meaningful from my point of view.

Response: We accept to not go into the imputation bridge part if it raises more questions than it helps our argumentation line. We have removed the related sentences from the manuscript and also Figure 2b

Minor comments (line numbers referring to the manuscript with track changes)

First of all, the manuscript should be proofread again. There are still numerous errors, especially in the changed passages. Furthermore, for the sake of readability, some sentences should be formulated in a more direct and compact manner.

Response: We have given the manuscript again to a native English speaker at our department and he has carefully proofread the document.

In general:

- avoid e.g. “spatio-temporal” vs. “spatio temporal”

Response: We have consistently changed everything to “spatiotemporal”

- try to avoid double brackets like “(Fig. X (a))” or similar

Response: We have removed all double brackets.

- on more than one occasion you write that “pixels experience” something. This sound strange and I’m not sure if this is correct English. The same goes for e.g. “the entire of Germany”, “the whole of Germany” and similar.

Response: We changed everything to “all Germany” when referring to Germany as a whole.

Numbers: use “,” for separating thousands, i.e. 1,000 etc. This is inconsistent throughout the manuscript, including the figures!

Response: We have carefully revised this and think it is consistent now through the manuscript, including the figures.

Regarding the use of “world record”: I made a mistake in my first review, I wanted to say that this term should NOT be used, sorry about this. In my opinion it sounds more like yellow press than scientific paper. Maybe something like “global precipitation extremes” is better...

Response: We changed it

Specific corrections (without claim for completeness)

Abstract: I suggest you write years, hour and day instead of yrs,h, and d here

Response: We agree and changed it.

- l. 1 investigated (the rest is past tense as well)

Response: Thank you! We have changed it.

- l. 19 “urban and non-urban flash floods” → are there any others? Just say “flash floods”

Response: We agree and changed it.

- full stop missing the same line

Response: You are right, it looks like it is missing in the revised version, potentially latexdiff did not convert it correctly. It is not missing in the new document.

- l. 21 “needing”? Sounds strange, rephrase

Response: We changed it to “requiring”.

- l. 22. “Obstacles to identifying and investigating extremes” → sounds strange, rephrase.

Response: We have changed it to: “It is difficult to identify and investigate extremes and record rainfall events because of their rare occurrence as well as …..”

- l. 23ff. makes no sense, “50% obwhich observed extremes”(?), “even more”(?) This is not clear, be more specific!

Response: For the sake of clarity we changed the sentence to: “Lengfeld et al (2020) analysed the problems of rain gauge observations, that miss more than 50% of the extreme rainfall events observed, especially with data of higher temporal resolutions.”

- l. 30 from may point of view, attenuation is also a major reason for uncertainty because this may reduce extremes

Response: We have added it to the list.

- l. 34 this is a 1:1 quote from the AMS Glossary of Meteorology. Mark this accordingly (or reformulate) and update the source to American Meteorological Society, 2020: Climatology. Glossary of Meteorology, http://glossary.ametsoc.org/wiki/

Response: We have marked it accordingly and updated the source.

Figure 1: I suppose you removed the triangles because another reviewer suggested this. I my opinion, the first version with the triangles was better….

Response: We also like the version with triangles, however, one reviewer suggested to make it consistent. As we do not have “single values” for the Regional extremes of Germany, we chose to only take the regression lines from all three examples shown.

l. 82 change to “extremes found”

Response: Thank you! We have changed it.

l. 85 “…a reprocessed…” delete “carefully”

Response: We deleted it.

l. 101f. change to “One QPE from German radar data RADOLAN (German: RADar OnLine Aneichung)” and add a citation

Response: You are right, we have added the following reference:

Winterrath, T.; Rosenow, W.; Weigl, E (2012). On the DWD Quantitative Precipitation Analysis and NowcastingSystem for Real-Time Application in German Flood Risk Management. Weather Radar and Hydrology, Proceedings of a symposium held in Exeter, UK, April 2011. IAHS Publ.,351. 323–329.

l. 111 “two formats” You mean “two versions”, I suppose the format is the same

Response: We changed it to “two versions”.

l.117 due → because of

Response: Thank you, we changed it.

l. 118 “have been”

Response: Thank you, we changed it.

l. 123: “values (compared below) compared to RADOLAN” repetition, rephrase

Response: We are sorry for the confusion here. The bracket “compared” refers to the general passage about missing values in RADKLIM, the second “compared” refers to the comparison with RADOLAN. We have removed the two words in brackets and have shortened the sentence a little.

l.125 I still think that the details about files sizes are not really relevant and this sentence can be deleted. If you decide to keep it nevertheless: “making” sounds wrong in this context

Response: We agree and shortened the passage to:

“The data is available as one layer for each time step. Since not all raster pixels are .....”

l. 131 “Some time series” → you mean “data in some areas”?

Response: We have changed it.

l. 136 “...red spots could mean...” sounds strange, rephrase

Response: We have removed Figure 2b and its related sentences.

Caption Figure 2 “needs”

Response: We changed it.

l. 144 “than the missing of any extreme values.” sounds strange

Response: We simplified it to: “than missing extreme values”.

l. 149ff difficult to understand, reformulate

Response: We changed the sentence to: “Time windows of up to 3 days were chosen for the analysis, with special focus on the sub-hourly and sub-daily durations.”

l. 164 “built” → developed?

Response: We agree and changed it.

l. 171 it is called “k-means”, sometimes the K is also capitalized, please check and use this consistently

Response: This is obviously true, thank you for notifying us. We have changed it accordingly, using K capitalized.

l. 198: “xx minutes” (?)

Response: Sorry if this was not clear! We have deleted the brackets and its content.

l. 199f “Hesse state” vs. “Bavaria” → stick to one convention. Furthermore, what the purpose of mentioning that this has not been documented in the news?

Response: We removed the “state” from Hesse and removed the passage about the non-documentation in the news.

l. 205 What are “maximum locations”? Do you mean the locations of maxima?

Response: Yes, we do and changed it.

Table 1 is a good idea, but much too detailed. Reduce to lat/lon to 2 trailing digits, precipitation to max 1, use CET and 24h Format for times, Location is WGS84 not WG84

Response: We provided the details since one referee asked as to do it for being able to check the results. We edited the table according to your suggestions: Reduction of lat/lon to 2 trailing digits, reduction of precipitation to max 1, used CET and 24h format for times and changed WG84 to WGS84

l. 209ff consider deleting brackets with the ranks, is does not enhance the readability. It’s sufficient to mention this in Figure 4

Response: We agree and deleted it.

l. 213 “3-regime-form” ->?

Response: We changed it to “three phase regime” as used in line 210.

l. 215 “Figure 5 shows the location of the high quantile rainfall” → delete the numbers for the sake of readability

Response: We agree and deleted them.

l. 216 reformulate this sentence, this is not correct

Response: We are sorry, that this sentences caused a problem and for the sake of better understanding, we rephrased it as follows:

Old version: “It shows that the number of locations increase the lower the maximum rainfall quantile is.”

Update “It shows that at the highest considered quantile (0.99999) multiple maxima appear at similar locations, potentially referring to the same rainfall events, whereas for lower quantiles (e.g., 0.9999 to 0.99), maxima are more spread over Germany and the visible points increase in number.”

l. 218-220 same as l. 216, hard to understand, rephrase

Response: We simplified the sentence as follows:

Old version: “Additionally, from a certain degree of quantile (Fig. 5 (d)) the locations of maximum rainfall contributing to the development of the rainfall-duration relationship seem to happen mainly in the wider Alpine region in South Germany.

New Version: “Additionally, locations of such high quantile maxima (e.g., 0.99 quantile in Fig. 5) seem to occur predominantly in the wider Alpine region in South Germany.”

Legend figure 4: “392,128 in total” or “n=392,128”

Response: We have changed it to “n=392,128”.

l. 230 please note that the red and yellow spots are difficult to see in a printed version

Response: We agree and tried several colour scales before to avoid that version. The authors' compromise was the current colour scheme.

l. 233 similarly located → rephrase

Response: We changed it to: located at similar places in the maps.....

l. 241 why don't you mention that the reference is a single power law right here?

Response: We agree and changed it according to your suggestions.

l. 245 what does "attached to the maximum rainfall event" mean? Rephrase!

Response: Sorry, if "attached" was not understandable. We have changed it to: ".... small (or zero) rainfall observations around a maximum rainfall event." We think that this clarifies that Galmarini et al. (2004) are talking about values before and after very high rainfall sequences.

l. 254 "The k–mean clustering algorithm successfully classified the depth–duration relationship into six categories" -> Of course, because you defined 6 classes, what's successful about this?

Response: If we are talking about the manuscript with tracked changes, this word has already been removed!

l. 257 "grid points" not elements

Response: We changed it.

l. 257ff. Why to you capitalize "Category"?

Response: We thought that the capitalizing enables a better reading. However, we removed the capitalization.

l. 261 "beginning of the curve"

Response: We changed it.

l. 265 smaller pixels → I assume that your pixel size is constant

Response: True! We changed it to: Smaller areas.

l. 267 "Category 1's" possessive s in combination with a number looks strange

Response: We changed it to "the slope of category 1".

l. 268 repetition of "location", rephrase!

Response: We have removed the comparison part of the sentence.

Caption Fig. 8: Rephrase to "Resulting clusters of the maximum depth-duration relationships"

Response: We changed it.

Figure 9 "??" in caption, missing reference?

Response: Sorry, we updated the reference.