Dear Brunella Bonaccorso,
dear referees,

we would like to thank you a lot for your support in editing and reviewing our article. Thank you for your appreciative and valuable comments and relevant questions.

In the following, we present our answers to the reviews as well as the changes made in the current version of our article (compare the marked-up version of our revised manuscript, lines numbers refer to this version). Please also note that this final statement is in large parts based on our answers to RC1 and RC2.

To start with RC1,

your main question was targeted at the influence of urban surface change on our study. We did not have a possibility of quantifying such change rates at the three study sites. We included a statement in the results section (lines 350–353) and took the issue up again in the discussion section (lines 447–450). It is likely that level changes took place to a certain extent between the flood mark survey in the early 20th century and the survey which has been part of this study. These changes may be reflected in the small differences between historically documented and current flood mark heights. However, base changes can have happened also prior to the historical mark survey. We added a statement on this uncertainty in the discussion section (lines 350–353).

We also want to answer your questions provided by the supplement. (We assigned sequential numbers to the questions to facilitate the location of additional paragraphs in the Author's track-changes file):

- Q1 (Line 199 in the supplement to RC1): "*It would be interesting to note here, or later possibly, whether any of the flood marks were informal compared to formal records."*

  See the answer to Q3.

- Q2 (Line 210 in the supplement to RC1): "*how many do you estimate had been lost?*"

  This is illustrated in Sec. 4.1.3.

- Q3 (Line 277 in the supplement to RC1): "*I think this is an important point, can you discern the proportion that are informal (painted) rather than formal (engraved). The characterization is itself assumptive, but is useful in thinking about the quality and accuracy of the mark. I have been looking at this, as part of the tools used in communicating risk and how knowledge can fade with time."*

  In our study area, it is difficult to distinguish between 'formal' and 'informal' flood marks. We do not have any information on the installation of the marks. We assume that a large part of the marks were installed according to official stipulations since many of them show similar appearances, however we are not aware of sources verifying this assumption. Actually, we doubt that the type of a flood mark (painted or engraved) could be a reliable decisive criterion to show the formal or informal character of marks in our study: nearly all collected marks are engraved but most of them are painted as well. Moreover, some older marks have been repainted and, due to weathering, it is not always clear whether or not they initially also had been engraved. We added a statement on the mark appearance in the results section (lines 279–281), and few sentences in the discussion (lines 476–480), referring to the question,

whether the appearance of a flood mark can provide information on its accuracy and quality (we believe, in our study this is rather difficult).

- Figure 4: *"A good figure, but consider how it may be viewed by those that are colour blind."*

  Thank you for the link. We have tested the figure and it appears to be fine.

- Q4 (Line 324 in the supplement to RC1): *"I think this is really interesting, anecdotally from a UK perspective I believe that it is the other way round, with most of the flood marks removed/lost as people want to sell properties […]"*

  This is indeed an interesting point. Observations similar to yours in the UK also have been reported from France, and we also know of places in the Elz catchment, which is directly south of our study catchment, where flood marks at houses have been removed even though it is forbidden by law. Fortunately, in the Kinzig valley, a different kind of mindset appears to prevail – at least locally. Possibly, it might be related to the long history of recurring floods and the strong dependence on the river with regards to timber rafting, which is a particularity of the Kinzig area. Finally, the reason for flood marks disappearing from bridges may be the comparably small size of (historical) bridges and their repeated complete destruction during large floods of the past. We added a few sentences in section 4.1.3 (lines 333–337).

- Q5 (Line 342 in the supplement to RC1): *"Could you add a sentence explaining how you came to this sum, is it just a pragmatic estimate of likely difference, or generated from some specific example or reasoning?"*

  This range of tolerance was derived from the (maximum positive or negative) height deviations between historically recorded and still preserved flood marks, excluding preserved marks that had been noticeably relocated or significantly modified compared to their original status (compare Fig. 3), as described in lines 345–358. Also excluded were four historically documented marks at a house corner in Schiltach (S24–27, Fig. 5d), which were found to be at similar lower heights (-0.25 to -0.325 m) nowadays. Yet these data have not been included in the range of tolerance: despite being in a good condition, the marks might have been reattached incorrectly as for three marks, either inconsistencies in mark inscription or mark position relative to the notch or relative to the side of the building (where the mark was positioned) were detected. In contrast to that, Figure 5c shows two marks (W28 and S15) with a very small height difference between the historical and the current survey. These marks did not appear modified or relocated and were included in the estimation of a range of tolerance. To clarify this issue, we added a statement to the manuscript (lines 353–356). We also changed the legend entry 'Lost mark' in Fig. 5c) to 'Documented mark' realizing that 'lost' does not apply to the marks W28 and S15.

- Q6 (Line 343 in the supplement to RC1): "*also potential for ground level to change if the street has been reflagged/resurfaced?"*

  See answer to Q7.

- Q7 (Line 354 in the supplement to RC1): "*Could this be a change in footpath/road/ground surface height rather than flood mark height. I have flood marks in York in the Merchant Adventurers Hall that are now below street level from the 1830s."*

Kerbs in Germany are normally between 5 and 12 cm high, high kerbs can amount to 15 cm. Thus, the construction or renewal of a footpath during the 20ths century (after the historical flood marks survey) could easily have led to a small in increase or decrease of the absolute flood mark height relative to the ground level (lines 356–358). We therefore assume that a change in footpath height could be a possible explanation for the small height differences that we have found for a couple of preserved marks, as explained in the previous comment to Q5. Yet, the significant height change of the marks mentioned in this question (in line 354 of the supplement) might have been caused by relocation, as explained above, but also a significant change of the base level cannot be excluded.

- Q8 (Line 358 in the supplement to RC1): "*You could consider adding a figure here with all of the flood marks presented and the relative difference based on current surveys. Is there a consistent reduction in level, or are some higher than previous recorded? If the difference is consistently a reduction in height then this might suggest that the relative height change is derived from an increase in street/surface level rather than a reduction in flood mark height. So far you have not discussed this - it might also help explain why the difference is greatest for older marks.*"

  In order to display all mark heights of historically documented and still preserved marks (together with the local flooding depths of the current flood hazard maps), we added an additional figure to Fig. 5 (Fig. 5 d). Regarding the question on the directionality of the relative differences, such a pattern is not visible in our data when excluding marks that very likely had been relocated. Marks that have not been altered significantly may be a little higher or a little lower today, regardless of whether they refer to e.g. the 1824 or the 1882 flood event. The few marks that have been subject to significant height changes and relocation (Fig. 5d) are at lower positions nowadays but this may be a coincidence as the marks rather appear to have been relocated (compare Fig. 3, and the comment to Q5).

To continue with RC2,

Regarding your first question on possibilities and examples of utilizing flood marks as a substantial additional value to an integrated flood risk management, we believe the manuscript already comprised some examples, as illustrated in our answer to RC2. We therefore highlighted paragraphs in the marked-up version of our manuscript in section 5.2, which present such examples. We also included additional points in the article in lines 557–559 and lines 588–590.

Your second question refered to the replicability of this study in other catchments or study sites than the examined sites in the Kinzig catchment, Southwest Germany. Here, we are confident that many other sites provide the basis for repeating this study or some of its parts. We highlighted paragraphs in the marked-up version of our manuscript in section 5.2 providing more details, and included a few new points in lines 578–582. Please also refer to our answer to RC2 regarding further details.

We hope that we could adequately clarify all issues that you have brought forward and want to thank you again for your contribution. Please do not hesitate to contact us regarding further comments.

Best regards,

A. S. Bösmeier, I. Himmerlsbach, and S. Seeger