

Interactive comment on “Late Holocene channel pattern change from laterally stable to meandering caused by climate and land use changes” by

Jasper H. J. Candel et al.

P. Houben (Referee)

p.houben@luc.leidenuniv.nl

Received and published: 13 June 2018

The paper on “Late Holocene channel pattern change [. . .]” by Candel et al. reports on the use of floodplain stratigr. records and chronologies to conduct a quantitative assessment of (paleo)hydrological channel planform change over the past 600 years in the NE NL. At a general level the manuscript is organised, the introductory sections provide background to the research, and give sufficient detail of the used methodology. The methodological approach and the subsequent evaluation of obtained results are based on a strong research effort, and the discussion puts the work in the context of previous work and addresses potential implications. All of which fits the journal’s scope. All in all, the ms represented a valuable contribution to ESurfD, however, in its current form it requires restructuring and (partially) rewriting at the paragraph level. Regarding given standards a number of statements are misplaced. For example, the Results section includes discussions of the findings, which is why the actual Discussion mostly reverts to a sometimes narrative analysis. The weakest sections, thus, are the Discussion and the Conclusions wherein some thoughts brought up and connections that are sought to be made should be reconsidered with respect to whether they actually add to the paper’s significance. In consequence, the abstract should be rewritten because it is not reflecting the actual paper content (and the balance of the featured aspects), and the highlighted findings are not supported by the employed methodology. At places abundant in-text citations in the Introduction can be perceived as a bit too excessive.

Key: rm - remove; rw - rewrite/reword;

Thanks for your kind words and your critical and valuable review on the manuscript. We agree and are thankful that your review made clear that the structure of the text should be improved. We moved large parts of the results to the discussion and focussed the discussion more on the main findings. Also we rewrote the conclusion and abstract.

p1: Title: Actually, the paper does not include hard information that allows for pointing to the actual causes of the described channel change. In the paper, a number of (truly) possible and plausible causes are mentioned but no conclusive evidence can be shown that helped to causally link channel change to either or both of the drivers. Why not highlighting the strength of the paper, the application of quantitative palaeohydrological approaches to answer the actual research question?

With the new input of the reviewers we agree that the title does not match the content anymore. Therefore we changed the title accordingly, highlighting both the channel pattern change and the palaeohydrological reconstruction.

13 - The Abstract . . . "related to changes in climate and/or land"

Changed accordingly

15-18 - Results are reported before the actual scope of the paper is given. And the approach is only explained later on. Rearrange to present a logical flow.

Agree and we rearranged the order

18 - Actually, no potential causes have been investigated. This is misleading information. Only other people’s work is cited in the Discussion when attempting to explain what possible causes have been around. The nature of that discussion, nevertheless,

remains speculative.

Removed the sentence

28 -29 - *'reflecting relative . . . '* this statement should be rephrased because it is ambiguous, and overall not intelligible when only reading the abstract.

Changed

31 - *The last sentence is not specific to the paper content, rather will appear like a motherhood statement to the journal's audience. Remove and replace it by strong statements that stress the significance of the own findings. The reason for the weak end of the Abstract, my guess, is the underdeveloped Conclusions section (see below).*

Agree and changed

34 - *'Several . . . '* Sentence can be deleted.

Removed

p2 5 - *In a braided river system, isn't the temporary presence of laterally stable/migrating channels (runnels) just a matter of stage at a time?*

Here we make a statement that refers to laterally inactive rivers, and rivers that show lateral migration. Both meandering and braided rivers can have channel reaches that are temporarily laterally stable. However, both meandering and braided rivers show in general laterally migrating channels. In this case the differences in processes between meandering and braiding rivers are irrelevant.

7 - *'variables like potential . . . '*

This is a matter of taste; we prefer our phrasing and made no changes.

7 - *rm: ', which is . . . slope'*

This information is needed to understand why Q_{bf} is reconstructed, which leads to the stream power. Therefore we leave this sentence.

8 - *'2011), bank erodibility (. . .), cohesiveness (. . .), and by vegetation (...).'*

Changed, but differently than suggested. Bank cohesiveness and vegetation are important factors determining the bank erodibility, so they should not be equally summed up.

9-10 - *rm: 'which is . . . (Turowski, . . .)'; 'that can increase . . . '*

Changed, but differently than suggested. See previous response

6 vs 11 - *Statements contradict each other*

Changes above have solved this

13 - *rm: gradually*

Changed

13-19 - *shorten para*

The paragraph consists of vital information of our current state of knowledge on channel pattern changes, which is entirely based on the change between meandering and braiding planforms.

We removed a few references to shorten the paragraph as suggested later, but did not shorten the sentences.

23 - *rw: 'the exception is formed by human intervention'*

Changed

23-34- *This para does not fit in here. The surrounding text provides background information that should translate into the 'gap' and clearly formulated research goals,*

however, this para explains processes of channel change. Could be moved together with p2 10-18 to line 18 on p3.

We moved this para together with the suggested para.

33 - Excessive citing . . . Can the information be organised into a table?

We decided to remove references and provide only references that refer to multiple river systems.

p3 11 - It feels as if already here the paper's research question is addressed, but the authors then return to reviewing literature.

Removed last sentence of paragraph

19 - Shouldn't the information be part of the first para on p3?

We merged these lines together with the previous para

20 - '.. stable channels poorly preserve except for . . .' rm all the rest between 21 and 25

Changed, and the removed lines are left for the discussion

31 - 'Huisink, 2000) while the meandering pattern has remained throughout . . .'

Changed accordingly

33 - rm: 'However'

Removed

p6 14-16 - This needs to be moved to the Intro. There, it was already used to justify the research effort. In general, most of the content of p6 should be part of the Intro because it is the background against which the present investigation can be justified. (I.e., it's potential value to inform restoration projects.) This is even more important as this point is picked up in the discussion as one of the more significant implications . . .

Rather than moving it to the intro we removed this para, as suggested by the other reviewers.

34 - In far can could the used features by local peculiarities due to their peculiar morphological context?

Unclear what is meant here, but we changed this section according to suggestions by the other reviewers

p7 7 - First sentences should not lead the Methods sections. Stating the paper goals belongs to the Intro.

We removed this section and stated this part more clear in the introduction

7-21 - The whole para is a mix of review (again) and methods description. Needs to be rectified.

Removed and moved to introduction section

Fig. 2, A - B - C designation is hardly readable.

You refer to use of the Fig2(a) and 2(b) etc.? We changed this for all references to figures.

p8 6 - r: ' (i.e. the full ..)'

Removed

11 - Estimating a statistical parameter for which others apply stacks of sieves by just visual(!) means? That might work depending on what the information is used for. For me this is a point for of major concern. Actually, the D50 value is key to the calculations performed employing eq. 8, 10, 12, 15, and 16.

This data was only used for the lithological description. The grain size analysis was used for the D16, D50 and D84, so the D50 in the equations was not based on the visual assessment. This is also described in section 3.4. We added a sentence to make this more clear.

While in general the methodology also accounts for ranges or error, I am not convinced that the 5% uncertainty is fair for this error-prone guesstimate. How good (=reliable, =reproducible!) can the far-reaching conclusions drawn be? (E.g., see fig. 10).

We did not use a 5% uncertainty for the D50, but we used the standard deviation derived from the grain size analysis

17-19 - rm: 'GPR . . . 2011).'

Removed

29 - replace: over -> with

Changed

30 - *What sort of laboratory prescriptions (= 'instructions')? Sounds like voodoo science, doesn't it?*

Removed this additional statement, not needed.

33- rm: the

Changed according to suggestions of other reviewer

33 - rm: 2nd sentence

Changed according to suggestions of other reviewer

35 - *'The scroll bars' . . . can be removed, or reword, or ..*

Changed according to suggestions of other reviewer

p9 18 - rm: first sentence

Changed

21-22 rm: whole sentence, it's just nomenclature

This definition is essential to determine where the sand-peat interface is located, and is necessary to report for the repeatability of the study. We decided to leave this sentence.

31 - *Why 5%? Can you justify this? Still a rather optimistic estimate.*

Agree, see previous response to other reviewers. We reviewed this assumption. We introduced a standard deviation based on different assumptions for the channel dimensions, by determining the relative error of Hbf for the meandering phase and assuming a similar relative error for the laterally stable phase, because both estimates are based on coring data. The relative error is ca. 10% of the Hbf. We took the same percentage of relative error for the other determined channel dimensions (A, P, W).

p10 Insert space between Fig. 3 and the text. The figure even may be left out.

Changed. We will leave the figure in, because it clarifies how the equations 1-3 were derived.

p11, 12 Nice figures. However, would it work for people who printed it in B/W?

Checked, and changed the colours of the lithogenetic units slightly to assure that B/W print will work. For the lithological cross-sections these colours can be distinguished.

p14 29-32 - *How was D16, D84 determined? Also visually? From the waterlogged sands that spread to either side when the sample material is pushed out of the Vander-Staay tube? I think this is a soft point of the methodology, in particular with respect to the heavy mathwork that follows to nail physical, hydraulic parameters of in-channel water and sediment flow.*

See comment above. The D16, D50, D84 were derived by the grain size analysis, not by the visual assessment. We added a reference in this line to section 3.4 to make this more clear.

p15 15 - *State what was actually used here. Rather an issue of the methodology than a result.*

We removed this sentence and decided only to use Brownlie, as suggested by the other reviewers. In fact, Brownlie uses variables that are known, and of which we can vary the uncertainty. However, Manning is a subjective estimation of what the river looked like in the past. We changed the approach

and only use the Brownlie, and we will compare the calculated Chézy value with values known from rivers of similar size and with similar river pattern.

27 - New para.

Changed

p16 28-33 - rm: 2nd sentence

Removed

p18 All in all, the whole Methods section could be more concise, focused. It would be worth to focus on the most important aspects and move the remainder to the Appendix.

We applied all the suggested changes by the 3 reviewers making the methods more concise. Reviewer 1 and 2 are in general positive about the methodology section, therefore we decided not to move any section to the appendix.

p19 6-11 - Reword.

Partly rewritten

10 - rm: 'Such a clear . . . Prathoek'

Changed

11 - rm: last sentence

Changed

20 - rw: abundant above

Text has been removed in response to other reviewers

Whole section 4.1.: Commonly, the ordering of geol. units is from old to young.

Changed in the newly introduced table, and we shortened the text..

p21 22-28 - 'Palaeochannel . . .' All this information interprets the findings. So it has to be moved to the Discussion.

Moved to discussion where we discuss the laterally stable phase

p23 Are all the diagrams necessary? Criterion: To which extent are they covered by the text?

We removed figures 8gh and 9b, because they were not abundantly referred to in the text.

p24 11- p25, line 5 All this information interprets the findings. So it has to be moved to the Discussion.

Agree and moved to discussion

p25 19 - Reword.

Reworded.

20 - rw: reached -> crossed?

Changed

Fig. 9 - Merge with Fig 8.

Because we merged Junnerkoeland and Prathoek in the calculations for discharge and flow velocity, we won't merge Fig9 and 8, because in Fig. 8 they are still separated. In addition, Fig. 9 is important and deserves more attention, so it can better be separated.

p26 6-11 - All this information interprets the findings. So it has to be moved to the Discussion.

Moved to discussion

16-20 - All this information interprets the findings. So it has to be moved to the Discussion.

Moved to discussion

p27 It is hard to read out information from figure 10c To much included into a single diagram. Simplify!

We simplified the graph, mainly by removing the dashed lines and making the y-axis logarithmic.

p28 I am not sure whether this is essential to the paper's scope . . . I see some potential to shorten the paper by moving this to some Appendix.

This part is essential to our key message, because with these empirical models we test the likelihood that discharge increase has led to the channel pattern change. So can we use the palaeohydrological parameters (including their uncertainties) and understand why the channel pattern has changed to meandering.

p29 20 - rm: 'by a factor ..' Do not repeat results already reported on earlier. Instead, conduct a more clear-cut write-up of the obtained results.

Removed

21 - This gives a minimum age (only). And only for a strong phase that has never been stronger afterwards. That is, the meandering may have been triggered at an earlier point in time, but the pertinent strata was just cannibalised by the denoted activity.

Yes, we improved the argumentation for this point. If earlier, the meandering activity has not been preserved, but we would still expect to find more channel cut-offs or meander scars in the floodplain, or some older scroll bar deposit. Even when the new meander cannibalised the old one.

22-23 - A strong statement. Still, is it actually supported by the calculated data given the inherent uncertainties? What if sediment transport rates (?quantity per unit time) was constant from an earlier time on? Isn't it possibly the same phenomenon as with terminal moraines? The most distal ones mark the last phase immediately before the 'dynamics' decreased. So they mark the onset of the decline. See the all the diagrams from 8 to 10, they all suggest a progressively declining meander activity.

Removed the sentence. However, we reconstructed the sediment transport based on the reconstructed channel dimensions, so the actual sediment transport at that time. The scroll bar growth is not a lagged effect, but is determined by the actual amount of erosion and deposition, and hence the sediment availability. In this case, we refer to the moment of the channel pattern change, not to the decline during the meandering. Scroll bar growth can only be this high during the channel pattern change because of an increase in sediment transport, which has increased as a result of the discharge.

p30 5-9 - Is perceived as speculative. Remove.

Removed this section

16-23 - Only speculation. Remove it, it is not connected to anything based on your methodology. Also, using climate data from the current climate normal carries a strong signal of climate change with characteristics being different from the pre-1980 period. The relationships that are constructed here are, therefore, very questionable.

Removed this section

Section 5.2.2 - Interesting, but how does it immediately relate to the methodology that was used? All the information is good for is to point out future avenues of research to clarify causes of what you observed on the floodplain (only). So this section should be shortened, dissolved, and merged with the hints that can be made regarding the role of post-Middle Ages climate fluctuations.

Followed the recommendations, also in agreement with the other reviewers.

p32 14-26 - All of this only repeats content of the Introduction. Actually, there it was used to justify the research undertaken. But its occurrence in the context of the Discussion section means that is an outcome of the study? Delete the section.

Agree and deleted this section

27-33 - . . . and therefore this para should be part of the Intro. There it would add to provide a logical flow of justifying the research question in view of previous research.

Agree and moved to introduction to support the research goals.

Section 5.5. River management and restoration This section mostly reiterates commonplaces

about fluvial morphology and stream restoration works. If you would like to keep it, then thoroughly rewrite it by making connections between your own findings and what they'd mean for the management and/or restoration efforts mentioned in section 2 (case-based!). And include a the pertinent background to that in the Introduction. This topic is actually adding significance to the present research, even though the methodological approach as such is not necessarily novel. Try to link your research to the current debate on the meaning of 'natural rivers' and stream restoration goals (e.g., Brown et al., 2018, ESR).

We removed the section, also following suggestions by the other reviewers. In future work we will definitely discuss its relevance to river management and restoration.

p33 The 'Conclusions' - Are no true conclusions but yet another summary of the main findings. Moreover, what was discussed as possible causes and mechanisms in the previous section now is phrased as it was an evidence-based outcome of the study. Here, another complete rewrite was required.

Rewrote the conclusions

Reduce # of in-text citations (adding too many citations does not add credibility): p2 - 8, 15, 17, 29, 33 p3 - 9 p6 - 15 p8 - 18 p30 - 32 p31 - 7, 15, 20 p32 - 19

Removed least important citations for the suggested locations.

Peter Houben Leiden University College

Interactive comment on Earth Surf. Dynam. Discuss., <https://doi.org/10.5194/esurf-2018-31>, 2018.