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. Anonymous Referee #2 Received and published: 12 June 2018

The manuscript "Late Holocene channel pattern change from laterally stable to meandering caused by climate and land use changes" aims to identify river channel pattern changes using sedimentary and geochronological data and to identify causes for these changes. The manuscript is well written, the topic is relevant and in the scope of the journal, and the concepts and ideas are sufficiently novel. The methods are consistent and well described. There are some minor to moderate shortcomings, listed below. When these shortcomings are resolved, I consider this manuscript as a valuable contribution to Esurf.

Thanks for your kind words and critical review adding significant value to the manuscript. Below we respond to each of the suggested changes.

- Some sections are written too extensively, and not all information is needed to answer the research questions. For instance, the details on river restoration in section 2 are not needed and can be limited to a minimum. Also section 5.4 and 5.5 can be shortened.

The same suggestions were given by Referee #1. We shortened or removed the suggested sections or merged them together. Our manuscript was shortened by ca. 3500 words, removing repetition and excessive information.

Section 2 (study area): P6, L29-37: A lot of assumption are made in this part. I suggest to move this part to section 4.2 (results). And then in section 4.2, you have to provide all available arguments to state that channel X is predating the meandering phase. Show data to support your statements (eg show the GPR profile). You have to provide good arguments to state that channel X is from a laterally stable phase, since this is an important point for the rest of the story.

We changed this section, removing the assumptions, as also proposed by reviewer #1. We indeed have no information on the age or stability yet, that's one of the outcomes of this research. We leave the introduction of palaeochannel X in this section, so our steps in the methods become more clear why we are investigating this palaeochannel.

Section 3.1 is not needed to my opinion. Aims are already explained in section 1 (Introduction); methods will be described in detail in the next paragraphs (3.2 and next sections).

Agree and changed also in according to the suggestions by the other reviewers.

- P9, line 29: How did you define the knick-point on the bank? What will be the effect on bankfull depth and discharge when using a different knick-point on the bank? You can try a sensitivity analysis to check the effect of the definition of the bankfull depth.

We measured in high resolution the banks of the palaeochannel with a GNSS. However, we now introduce uncertainty by taking the first clear knick-point on both banks, causing differences in channel dimensions.

P9, line 31: Why a standard deviation of 5%? Which arguments do you have? This is an important point, since large parts of your interpretations are based on this standard deviation. If you assume a standard deviation of 10 or 20%, it is possible that your differences explained in figure 8 are not so clear anymore. Can you provide a consistent method to define the standard deviation? Also here, you

can try a sensitivity analysis to check the effect of the standard deviation. - Same question for P10, line 9.

We reviewed this assumption. We introduced a standard deviation based on different assumptions for the channel dimensions (see comment to other reviewers), 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).

– *Section 4.1: You can summarize this section in a table showing the most important characteristics of the different lithogenetic units. The table can then be followed by a short paragraph on defining the scroll bars and scroll bar dimensions.*

Agree and changed according to your suggestions. The other reviewers also agreed that section 4.1 should be shortened, hence a table provides a good solution to do so.

Section 4.4: L11: Use statistical tests to check if the reconstructed discharge differs significantly. Given the uncertainty range it is possible that you can not reject the null hypothesis (Q does not differ). The same for L13: 'Q drops relatively fast at 1800 AD': Given the uncertainties, it is possible that Q is not significantly different. Use statistical tests to support your statements. P 29, L20: It is also likely that the discharge does not differ significantly, given the uncertainties. See my previous comment.

We added a section on how much parameters have to change to reach similar results in sect. 4.4. These factors fall outside the range of the uncertainty of these parameters, hence values between the laterally stable phase and meandering phase are significantly different.

- *Section 5.2: This section mainly brings together results of previous studies and it is not based on new data. So this section should be shortened and should link better to your own data and findings. Try to better link quantitative data on climate change and land use changes with your findings.*

Agree, we rewrote this section and merged it with 5.2.1 and 5.2.2.

- *Section 5.2.2: Is there an observed increasing in urbanization in your catchment? Urbanization can cause higher peak discharge, which have been described in catchments in The Netherlands.*

Urbanization is an important factor in recent land use changes during the last century, where paved roads cause flood increases. However, during the Middle Ages roads and cities were by far not that well developed compared to recent developments (see also Lanen et al., 2015 on archeological studies on road infrastructure, including the area of interest)

- *P31, L6 and L11: 27% of the catchment was covered with peat + yearly average discharges can increase by 40% => ca. 11% increase in average discharge for the entire catchment. How does this compare to your reconstructed increase in discharge?*

Thanks, we added this comparison to the text.

- *P 31, L 29-31: "Our data strongly suggest": not correct. As you stated in section 5.2 it is likely that the increasing discharge caused the change; you have some good suggestions but no hard evidence.*

Changed the entire section according to suggestions of reviewer 1. We removed these strong statements.

"The most likely identified causes": actually these are the only factors checked. You did not checked other contributing factors. –

Changed the text and the aim of the paper in agreement with all reviewers. Identifying the causes is not the main aim of the manuscript anymore, hence we mention the likely causes.

Figure 4: Indicate the location of the datings on Figure 4e.

We added the locations of the datings on Figure 4e and extended the southern part of the figure so they would all be included.

- Figure 10c: this figure is not entirely clear. The dashed lines do not help. Try to simplify this graph to make it more clear.

Changed the figure according to suggestions. We removed the dashed lines and added a log-scale to the y-axis to make everything more visible.

- References: For some references, correct volume, issue and pages are missing: P36, L5-6; P36, L24-26; P36, L56-57; P37, L40-41 (I may have missed more).

Check and changed