

Earth Surf. Dynam. Discuss., referee comment RC2
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Comment on esurf-2021-50

Laure Guerit (Referee)

Referee comment on "Autogenic knickpoints in laboratory landscape experiments" by
Léopold de Lavaissière et al., Earth Surf. Dynam. Discuss.,
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The paper by de Lavaissière et al. presents lab experiments designed to explore the dynamics of knickpoint initiation and retreat under constant rate of base-level fall. The novelty of their experimental is the unconstrained width of rivers and this leads to new and very promising results. Based on their observations, the authors propose a conceptual model of autogenic knickpoint formation related to changes in river width. Autogenic processes are more and more recognized as major components of landscape dynamics and this work is a very nice contribution to this topic.

Yet, although I think this study has a great potential, it is a bit blurred in the current version. I identified several reasons for that which I present below together with general and specific comments. I do not see any major issue as I feel that this is mainly related to problems of syntax and general structure. Therefore, I'm confident the authors could address my comments or any from other reviews and I look forward to seeing this work published in ESurf.

All the best,

Laure Guerit

Abstract

The use of the numerical model (Floodos) should be mentioned. I really like the use of numerical models, it is a great way to extract quantitative informations from lab experiments so you should advertise for it.

Introduction

The introduction is clear and simple, which is nice. However, I think that the manuscript would gain in strength and quality with a better contextualization of the experimental approach (see also my comment below about autogenic processes). In fact, from the current manuscript, it is bit difficult to get a clear idea of the real addition of this work. This is done later in the Method but I think it should be in the introduction.

In addition, the paper is mostly focused on knickpoints and I missed something about autogenic processes (beyond the conclusions of the study itself). I think the paper would be enriched by addressing this topic too in the introduction and/or in the discussion. It would broaden the impact and the potential audience. You could for example have a look at the review by Hajek and Straub in 2017 (<https://doi.org/10.1146/annurev-earth-063016-015935>).

l. 27-28: suggestion: the definition is ok but it would work for any step along a channel. Maybe add a scale ?

l. 42 to 44: this sentence and the references are not really needed, maybe simply start with However or something similar. This would lighten the text a bit.

l. 44 please change "they" to "knickpoint" (the sentence is a bit unclear with "they")

l. 46 I do not understand what "they" stands for

l. 50 maybe specify which forcings.

l. 50 I do not really understand this sentence. Do you mean that landscapes alternate between periods of steady state and periods of knickpoint propagation ? Please reformulate.

Methods

I would appreciate (here, in the discussion or even in Supplement) a discussion about the choice of material and how it could affect your results.

I would present the three experiments here and not at the beginning of the results (therefore, Table 1 should also be moved here). This would give a better sense of what you did and it would also help with some issues with text organization (see my comments on Figures 1 for example). Finally, to ease reading, I suggest to structure the Methods into 3 subsections 1) experimental setup, 2) knickpoint extraction, 3) hydraulic data extraction.

l. 70 please give values for the base level fall rate.

l. 73 the description of the initial configuration should come before the experiment itself.

l. 98 what does "correctly" means ? This sentence suggest that you define knickpoints based on erosion rate and that you consider them as "correct" based on another criteria (slope I guess) ? The procedure is not that clear, please consider rephrasing.

l. 111 to 126: almost word by word repetition with the supplement material.

l. 116: the outputs are repeated line 118. Consider rephrasing

l. 117 the use of "spatial distribution of precipitation" is strange as as you state on the previous page that precipitation are constant. Do you refer to heterogeneities (inherent to the experimental design) mentioned in the supplement ? This should be clarified.

l. 111 to 136: I found this while paragraph difficult to follow. Please try to be more straightforward or to rephrase a bit.

Results

The text misses a clear organization and suffers from repetitions. This prevents me from getting a clear sense of the main results of the study, although I believe the material is already here (I think that lines 195 and 295-296 are the main results of this study). Some ideas to help rephrasing:

- figures are sometimes described instead of being used to support a result (l. 159-161, l. 190-191, l. 251-257) and some of them are barely used (Figure 6 for example).
- repetitions (for ex. l. 188 and l. 195, l. 197-198 and 198-199)
- use numbers to quantify your statements. There are only three experiments, it is really easy to be more quantitative. For example, line 159, 166: give the three values. l. 167

"increase in average": there is only three points so I assume you can be more specific, l. 176 "very comparable" is quite vague.

- the initiation of knickpoint section could come before the section on the dynamics (knickpoints must form before they can propagate)
- split the text when a new idea is developed (some suggestions : l. 171, l. 277, l. 284)

The normalized distance to divide (l. 174) and the normalized longitudinal distance of maximum velocity of knickpoint (l. 237 - maybe find a simpler expression ?) are important parameters for your study. I think they should be defined in the Methods, not in the Results. Once again, this is give a better organization to the manuscript and ease the reading.

l. 299-233 seem to be rather discussion

l. 233 which effect ? please specify

l. 240-243 this paragraph is a bit confusing. The authors state that there is no clear tendency but that there is positive correlation (that I could indeed observe in both graphs). Please reformulate, make your point clearer and do not minimize your results.

l. 264 and 269 "first knickpoint" should be "second knickpoint" as you mentioned that a knickpoint is already there l. 261.

l. 265 quantify "widens"

l. 267-271 syntax is a bit complex, please consider rephrasing for simplification

l. 276 and 277 third ?

l. 283 the mean is positive but the median is negative. What does it imply, could you comment on that ?

l. 288-299 sounds a bit like discussion. Please avoid repetition (l.288-299 and 295).

l. 436-440 almost word by word repetition of l. 229-231.

Discussion

Here again, I would suggest to structure the discussion into subsections to ease the reading. A general comment for this last section is that the authors do not highlight their specific contribution. I really think this study has a great potential to document in a quantitative way the initiation and dynamics of autogenic knickpoints and the authors even provide a mechanism (via river width) for that. However, this is somehow hidden in the text.

The paper could do better here with the idea of autogenic knickpoints: what are the implications for stratigraphy or for tectonic studies ? How to recognize autogenic from allogenic knickpoints ? I really think the paper would gain in strength by addressing these questions in the discussion.

The concluding paragraph does not give credits to your work and I can not get a sense of your results from these lines. "Our model is consistent with this proposition" is quite a limited conclusion for your study.

l. 369 why admitting ? you just demonstrated this !

l. 393-410 to me, it is a major outcome of this study, that could almost belong to the Results. This should be highlighted, maybe with a conceptual figure ? As mentioned elsewhere, I think that figures could be simplified and some even removed so it's ok to consider a new one. I may have miss it but why do rivers widen at all ? Also, you mention that erosion is inhibited after the passage of a of knickpoint but widening implies lateral erosion. Maybe specify vertical erosion or discuss this point a bit further.

l. 440-445 this is already said in the results. Consider removing these sentences.

l. 425-426: this is already said l. 421-422 and said again l. 433-434. Please simplify.

Additional comments

I noticed some minor language mistake. It did not alter my reading or my understanding

of the work but it should be corrected. The text could also be simplified with a bit of rephrasing. Syntax is sometimes complicated, I noted a lot of repetitions and you could change structures like "On the graph shown in Figure 11C (l. 257), [...]" to "normalized values of [...] (Fig. 11C) . This would lighten the text and give some space to develop the suggestions proposed by the reviews.

Nomenclature: I guess the names of the experiments are related to your work flow but it does really served the manuscript. To make it easier to read, what about experiments 1, 2, 3 (or 5- 10-15 to refer to the rate of base level fall) ?

l. 32 sel-level -> sea level

l. 40 limitation -> limitations (?)

l. 74 remove "here"

l. 116 missing capital f (floodos)

l. 171 (and elsewhere in the text): "In order to be able to compare" can be reduced to "to compare". Such a simplification would ease the reading and shorten a bit the manuscript.

l. 174 Figure 2 should be Figure 4

l. 176 remove regardless

l. 329: missing word after "once a knickpoint has" (I guess it is "passed")

l. 413: "is" instead of "in"

l. 417: missing space (Fig.12)

Figures and table

As a general comment, the figures are nice and clearly illustrate the experiments and results, but they are sometimes a bit dense and could benefit from simplifications and harmonization (see specific comment below). The size of the text changes from one figure to another and is sometimes very, very small. I suggest considering a fixe, readable size and to adjust the content of the figures.

Finally, some figures are not exploited at their full potential. For example, Figure 1 is only referred to once. The individual panels of Figure 1 and 3 are not referred to and there is no reference to Figure 13. The text should take better advantage of the illustrations and/or figures could be simplified or moved to the Supplementary.

Figure 1

Panel A: please indicate the total height of the box.

Panel C: I can see numbers of the left and right sides of the box, what are they for ?
caption: the experiments are not introduced at the point of the text. Please adjust either the text of the caption.

Figure 2

Text is really small.

caption: the experiments are not introduced at the point of the text. Please adjust either the text of the caption.

Figure 3

Panel A: the superposition of the DEM colormap together with the water depth colormap makes the figure a bit complicated to read. The elevation does not seem to be used so I suggest to remove the colors. Maybe use grey shade/ slope illumination only ? If you keep the colors, please add the color scale.

Panel B: axis numbers are very small.

caption: it is very long ! Most of it should be in the main text. l. 146: shallow instead of thin ?

Table 1

nDDmax is not a straightforward variable. Please use the full name or define it in the caption

Mean knickpoints retreat rate: do these values come from Fig. 8 ? If so, maybe use similar units to ease the reading. Also, 4 digits after the comma might be a bit excessive.

Figure 5

caption: please describe the inset figure

Figure 7

The colors scale of experiment 9 should be the same as experiments 6 and 7 to ease the comparison.

caption: please indicate what are the blue, orange and yellow lines for.

Figure 8

Text is quite small.

The 3 panels are more or less similar and are just different ways of presenting the data. In order to simplify and gain space, I suggest to choose one way and to remove the other ones (or to move them to the supplementary).

Figure 9

caption is a bit unclear, please use full wording instead of symbols.

Figure 10

Panel B is referred to before Panel A, please adjust the text or the figure.

Panel A: what do the changes in colors correspond to?

Panel C: missing color scale for the elevation. The indication of cross section is a bit difficult to read, maybe try in white ?

The caption mentions the propagation of two knickpoints together with blue and orange colors that I do not see. Please correct.

Figure 11

Text is small

Panel C: y-axis is "normalized erosion or sedimentation" but in the caption, it is given as "normalized elevation changes". please correct.

caption: FD should be D. "Orange solid [...] percentiles": as in Figure 8B, this could be in the legend of the panels.

Figure 13

I found no reference to this figure in the text.