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Earth Surface Dynamics Discussions

Interactive comment on "Experimental evidences for bifurcation angles control on abandoned channel fill geometry" *by* Léo Szewczyk et al.

Léo Szewczyk et al.

leo.szewczyk@mines-paristech.fr

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JS: This manuscript describes experiments showing controls on sand plug length and volume at the distributary bifurcation of a river. The experimental design and analysis convincingly show that under these experimental conditions, (a) an increasing diversion angle reduces sand plug length and volume, and (b), that an increased slope in the channel with the depositing sandplug produces larger length and volume. The generalizations to field scale sandplugs is reasonable, although the generalization to the permeability structure of a channel belt is perhaps too far. I find these results to be a thorough and clear scientific advance. Apart from a sprinkling of sentence edits (see below), it is well written, illustrated, and argued. I think it will make a strong contribution to ESURF. I have sat with this paper for three days, and I can't find a significant flaw.

Hence, I recommend it for publishing with the technical below.

AR: We thank the reviewer for the positive and constructive comments. The effect of sandplug architecture on channel belt permeability is a current focus in the frame of the first author PhD thesis but we acknowledge that the generalization made is a bit too much. We will slightly modify the discussion accordingly.

Minor comments:

JS: Line 8: such as sandplugs

AR: This will be corrected as suggested.

JS: L12: Recommend letting the abstract reader know that this is an inverse relationship.

AR: Thank you for pointing that out, this will be specified.

JS: L13-14: Consider revising these lines so that initiates is not used twice.

AR: This will be done.

JS: L16: lacks *some of* the complexities. Physical experiments are valuable because they include a great deal of complexity.

AR: Indeed. We will do the correction as suggested. What we meant is that in the set up, the system is a bit confined compared to other experiments on delta for example. It is for this reason that the transport law was tested.

JS: L17: It is unclear how this paper "improves the realism of fluvial models. Consider revision.

AR: The relationships shown in Figure 7 could be a step forward to model channel fills in geomorphic and reservoir modeling, with implications on the realism of the topography of the alluvial plain and the facies ($\sim$grain size) distribution of sedimentary deposits. For instance, the models for evolving meandering channels using the Hasegawa-Ikeda-

Parker-Sawai equation (Parker et al., 2011) do specifically model channel fill and sometime assume 100% filling with mud plug. Using a dependence of sandplug length and volume on bifurcation angles will improve these models. In the case of more detailed models, these relations could be tested together with the dynamics of the flow separation zone. We will modify the abstract and discussion to detail these aspects.

JS: L28: Donselaar and Overeem (here and elsewhere in manuscript).

AR: Apologies. This will be corrected throughout the manuscript.

JS: Equation 2: Is it really 2ËĘ(2/3) in this formulation?

AR: Thank you for pointing this out. The correct formulation is indeed 2ˆ(3/2). It will be corrected on the manuscript. This is a typo in the manuscript; the formula used for the calculations was the correct one.

JS: L172: How is it know that velocity was lowest? Was it visual inspection? This is fine, but please say so. Or is this an interpretation due to the presence of the bar? In the later case, I would not necessarily interpret that the velocity was lowest.

AR: We used visual inspection. Some small suspended particles were trapped in the eddies this area prior to bar growth, allowing us an easy determination of the relative flow speed with the other part of the channel. We will point this out in the manuscript

JS: L185: Scenarios?

AR: This will be corrected as suggested.

JS: L239: hypothesize

AR: This will be corrected as suggested.

JS: L276: Far above the *bottom* ones. I don't know what bottom adds here.

AR: This is indeed a typo that will be deleted.

JS: L292: "Repartition" is used four times in the manuscript, but I do not know the

meaning of this word.

AR: It is a mistake and was intended to mean "partitioning". The four occurrences have been corrected to "partitioning".

JS: L292-3: incidence angle used twice in the same sentence.

AR: The second occurrence will be deleted as it doesn't change the meaning of the sentence. ". . .symmetrical configurations with incidence angles above the 30° threshold (Fig. 3e)."

JS: L313: explicitly name the relation between width and discharge Lacey's law, if you will refer to it as such in line 319

AR: This will be done.

JS: L314: disconnected channels

AR: This will be corrected.

JS: L315-316: a somewhat confusing sentence.

AR: We will rewrite as follow: "Both the equilibrium slope of the inlet channel and the slopes of disconnected channels observed in the experiment are consistent with the threshold theory and remain within the uncertainty range (Fig. 8b). However, in the case of levee breach equilibrium slopes are gentler than the theoretical equilibrium slope, and in the case of no forcing scenarios slopes are steeper."

JS: L344: "field investigations" instead of "investigating on the field"

AR: This will be corrected.

JS: L367: The authors seem to suggest that a channel plug could extend 3-4 point bars, or 3-4 bends into an abandoned channel. This seems like an extremely long way based on my intuition. Are there any field studies that show this type of extension?

AR: This seems indeed to be a very long sandplug extension, especially because we

are used to track it using satellite images. When looking under water, the plug deposits are thinning away but do extend further. In the Rhine Delta, some bedload deposits have been shown 3 to 5 meander bends of avulsion channels (admittedly ones with low sinuosity) downstream of the bifurcation point along cross-sections by Stouthamer (2001) and Toonen et al. (2012), although the purpose of their papers was not to study those deposits in particular. We will point these references in the discussion. We will add the following reference: Stouthamer, E. Sedimentary products of avulsions in the Holocene Rhine–Meuse Delta, The Netherlands. Sediment. Geol. 145, 73–92, 2001.

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