

Interactive comment on “Network response to internal and external perturbations in large sand-bed braided rivers” by F. Schuurman et al.

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General Comments

“Network response to internal and external perturbations in large sand-bed braided rivers” by Schuurman et al. contains an interesting set of experiments using Delft3D. The 14 different model scenarios combine an extensive variety of initial conditions, hydrodynamic regimes, and morphodynamic manipulations; however, the breadth of the study may overshadow some of the key messages that the authors are attempting to convey. I believe that some restructuring of this paper, and perhaps the addition of a supplementary information/figures section, would help the authors to streamline the flow. Further development of the discussion and conclusions section is also critical, including more clarity on the new contributions of this paper.

C77

I recommend that the authors select fewer of their model runs to present in the main text results that should be discussed in more detail, and the rest of the results could be included in a supplementary information section. One way to restructure would be to combine a results and discussion section, and then walk through the most important experiment results with a short discussion included in each of the subsections, where the authors can highlight the key points that they want to convey from each experiment. As of now, a large volume of results are presented but not really developed or discussed later, which makes it difficult to determine the most important and novel points of this study. If the information can be distilled down to the most important points, and then the discussion and conclusion flushed out (especially to point to novel contributions), I believe that this paper’s scientific significance, quality, and readability would be greatly enhanced.

Specific Comments

p. 198

The abstract does little to highlight new concepts brought forward by the work. Better development of discussion/conclusions section may help to hone the abstract, too.

I. 5: I would include that you are using the physics-based model “Delft3D” in the abstract

I. 12: “reshape” is a verb, not a noun. This word needs to be replaced with either “reshaping” or “shape” throughout the text and captions

II. 20-22: This is a broad statement. Perhaps give examples of what sorts of challenges?

p. 199

I. 23: “in and along the river”: do you mean rivers in general? Or one of the specific ones discussed above?

C78

l. 28: “identifying morphological effects of a measure”: I do not know what you mean here. . . effects that arise from a manipulation or perturbation?

p. 200

Might make sense to move the paragraph beginning on l.6 (addressing braided river dynamics) before the previous paragraph (talking about the effects of human manipulations of the dynamics)

l.16: “back-water” should be changed to “the backwater effect”

ll.24-27: couldn’t downstream effects, such as large dams, be a player here? State that these are the three perturbations that you’ve chosen to address in this study

p. 202

l. 4: “predicted by theory”: briefly explain what the theory is here

l. 12: “variable success” might be better stated as “variable results”

p. 203

l. 15: again, I would introduce Delft3D here (and also earlier in the abstract)

You state your research questions and then say that these can be addressed using basic engineering rules. So how does your study further the understanding of the field? A comparison of your modeling results to the theoretical ones? More specificity would better direct your reader here. I’d also like to see citations for ll. 22-27.

p. 204

I don’t think you need to include eqns 1-4. The audience is likely familiar with Delft3D, and you could just state that you’re using the shallow water equations.

p. 206:

l. 19: you don’t always use a constant discharge

C79

l. 25: Makes me wonder why didn’t you just use an aspect ratio of 2 for your cells?

p. 207

l.4: you state the morphological factor already above

l. 13: “SD”: spell it out the first time – I assume standard deviation?

p. 209

A better motivation for including section 2.5 would be useful. For example, the IP is introduced here (p. 210), and then it doesn’t appear again in the results?

eqn 6: should there be a citation for this equation or is this an original contribution? Unclear.

p. 210

l. 21: “Theory predicts” citation? What theory?

p. 211

l. 9, 15: are the predicted celerity and bed level adaptation length for the model experiments in this study?

l. 14: “BI”: do you mean “ABI”?

l. 18: “later, the situation changed”: can you be more specific about what situations and what changed?

p. 212

l. 14: would be useful to explain briefly how you know that the system has reached a dynamic equilibrium. . . ABI plateaus?

l. 18: “the channel network statistics”: here, are you only talking about runs 3 and 4?

l. 26: “Fig. 5a” – maybe better to say feature A in Fig. 5? My first instinct was to look

C80

for panel A.

p. 214

I. 2: "floodplain erosion distance": is this an average?

I. 4: what is the width increase along the Brahmaputra? Useful to include the value and a citation

p. 214

I. 13: "Now": you mean at 6 months?

II. 25-26: briefly explain that the backwater effect causes enhanced deposition upstream

I. 28 (to next page): "indication of the bifurcation instability" – why is it an indication?

p. 215

I. 4: usually a dam is constructed across an entire river rather than just a branch. Can you develop the relevance of this scenario or give an example?

P. 216

I. 6: you state that the results from run 12 are "more realistic" than run 8. Perhaps you should just include the results from run 12 in your results and include the run 8 results in a supplementary document?

I. 7: specify that it's a water "impoundment"

p. 218

I. 1: "diverse": you mean diverge?

I. 15: again, you say that runs 10 and 1 are more realistic than run 7 – could run 7 results be included in supplementary info?

C81

I. 20: "long-distance effects exceeded the medium-distance effects": this is really hard for me to see. The bars all look fairly similar to me in the bottom 3 panels of Fig. 11a at $x > 50$ km. Are there specific features that you can point to in order to demonstrate the differences?

p. 220

I. 2: "many similarities": can you state what the similarities are?

I. 22-23: "This merging of bars fast much more pronounced..." not clear what you're saying here

p. 221

The first two paragraphs of the discussion feel like they are the start of a conclusion section.

p. 222

I. 19: "according to theory": what theory? Citations?

Figure 17 is quite interesting and serves to unify the results from some of the model experiments. I'd like to see this part more developed – what sorts of morphological differences arise from these different types of perturbations? Clearly they don't all have the same effects. This could be a place where you could work to develop the novel contributions of this study.

p. 224

I. 3: what about the bank erosion procedure in Delft3D could be improved? Or briefly state what it lacks

p. 225

II. 9-10: the effects of the perturbations that you explored in these scenarios did not have a big backwater effect, but that's not to say that the backwater effect wouldn't

C82

play a larger role in other situations. For example, a large dam constructed across the entirety of a river would have a huge backwater effect (if creating a large reservoir), or if a river had a lower gradient, or lower Froude number, this effect might be more important.

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