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Earth Surface Dynamics Discussions

Interactive comment on "Opportunities from low-resolution modelling of river morphology in remote parts of the world" *by* M. Nones et al.

Anonymous Referee #3

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Overview

This paper illustrates how a simplified 1D modelling tool can be used to study channel morphology and morphological change for rivers where detailed data might not be available. This is particularly pertinent for remote rivers and for rivers in the developing world. As an example, the model is applied to two investigations: one of the impact of damming on the Zambazi River, and one on the impact of climate change on the Parana River.

The paper is well structured and easy to read, although there are a number of corrections to be made with regards to spelling and grammar. The study is also notably well placed in the context of recent literature.

The presented research is of broad interest to anybody doing research on remote rivers, or on undermonitored rivers. Overall the manuscript is worth publishing, but some aspects of the study need clarification or expansion prior to publication. These are listed below.

Manuscript Evaluation

Scientific Significance: 2 (good)

Scientific Quality: 2 (good)

Presentation Quality: 2 (good)

1. Does the paper address relevant scientific questions within the scope of ESurf? Yes

2. Does the paper present novel concepts, ideas, tools, or data? Yes

3. Are substantial conclusions reached? Yes

4. Are the scientific methods and assumptions valid and clearly outlined? Yes

5. Are the results sufficient to support the interpretations and conclusions? Yes, although more quantitative or graphical illustration of the results of the Zambezi simulations would be helpful.

6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? Some more detail about the simulation configuration would be helpful (maybe as supplementary material)

7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Yes

8. Does the title clearly reflect the contents of the paper? Yes

9. Does the abstract provide a concise and complete summary? Yes

10. Is the overall presentation well structured and clear? Yes

11. Is the language fluent and precise? It is fluent, but some spelling errors and grammatical errors need correcting.

12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? Yes

13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? Yes, some parts should be clarified. See comments below.

14. Are the number and quality of references appropriate? Yes

15. Is the amount and quality of supplementary material appropriate? n/a

Comments

The model description is minimal. This obviously is the authors intention, to avoid too much overlap with earlier publications on this model. However, some elaboration might be useful to make the model understandable for the current readership. For example, the authors indicate (p.415, ln.18) that two parameters (α and m) were calibrated, and that the other 3 parameters (n, p, q) are a function of m. The reference for this (Di Silvio, 1983 - in Italian) is not easy to trace, so it would be helpful to see how these 3 parameters are related to m. In a more general sense, it would be helpful if the authors can explain how the calibration was done, and how sensitive the model is to the two main parameters. Similarly, the authors mention (415, 11) that the "morphological box" of the model is about 50-80 km for both studies, but they do not mention how this value is derived nor how sensitive the model is to the choice of this value.

The description of results is largely qualitative, particularly for the Zambezi simulations. It would be helpful to have a more quantitative or graphical representation of results. For example, when discussing the results for widening, narrowing and deposition in the Zambezi River (417, 11), there are no figures to illustrate any of this. Please include a graph or map of channel widening and narrowing as well as of deposition for both the

undisturbed scenario and the dam scenario. A visual representation will make the results more easy to understand. The same applies for the channel planform description (417, 20).

It would also be helpful if there was some sense of accuracy of the model – either by comparison with a 2D model or through application on a different river where detailed data are available. The meaningfulness of current results is difficult to interpret without having an idea of the reliability of the model.

One limited attempt at assessing the models reliability is given in Figure 4a, which shows the simulated sediment yield and the observed evolution of the Zambezi's delta area. The authors use the correlation between these two data sets as a qualitative argument for the model's appropriateness (418, 10), i.e. the observed decline in delta area is used as an argument to support the notion that the simulated reduction in sediment transport is at least qualitatively reliable. However, there are some problems with this idea. The simulated sediment yield decreases by 60% between 1968 and 2013, with most of that decline occurring around 1973-1975. The delta area indeed decreases as well, but the change is less dramatic (only 0.3% over the same time period) and is more gradual. Moreover, there is a period of increase in delta area (1990-2000) which is not represented in the model sediment yield. Given that the correlation only broadly holds over the period as a whole and does not match the more specific trends within that period, and given that the small change in delta area (relative to the total area; at 55 km2 the decline is still quite notable in absolute terms), and given that other factors can play a role in the shoreline morphology (and hence the area) of the delta (418, 12), I am not convinced by Figure 4a as an indicator of model reliability.

Minor edits

410, 8: substitute-support change to: substitute or support

410, 9: multi-parameters change to: multi-parameter

410, 13: model's parameters change to: model parameters

410, 18: non-detailed scale change to: coarse resolution

411, 13: no systematic and detailed surveys of observed morphological changes are reported in literature, which might have been applied to validate a 2-D model change to: no systematic and detailed surveys of observed morphological changes, which might have been applied to validate a 2-D model, are reported in the literature.

411, 28: investigated change to: found

412, 1: it was observed a continuous and progressive oversimplification of the river channel planimetric morphology toward a lower width to depth ratio regardless the occurred oscillation in hydrology change to: a continuous and progressive oversimplification of the river channel planimetric morphology toward a lower width to depth ratio regardless the occurred oscillation in hydrology was observed

412, 4: pointed out change to: attributed to

412, 4: alluvial planes change to: alluvial plains

412, 4: decreases change to: decrease

412, 5: constrains change to: constraints

412, 16: highlighted passing change to: highlighted when passing

412, 19: constrains change to: constraints

413, 3: into Angola change to: through Angola

413, 7: storage capacity change to: storage

413, 9: long about 650 km from change to: about 650 km long, flowing from

414, 15: firstly change to: first

414, 15: developed various years ago by change to: developed by

416, 18: discarded; in those cases change to: discarded, since in those cases

416, 24: Zumbo, Mozambique: please indicate this town on the map in Figure 1B.

419, 26: As far as concern change to: regarding

419, 26: cross-sections width change to: cross-sections' width

420, 12: tents of centimetres change to: tens of centimetres

420, 18: alluvial plane change to: alluvial plain

420, 22: constrains change to: constraints

420, 23: constrains change to: constraints

421, 8: delete sentence: These simplifications gave ...

425, 14: Guerrero et al. (2013c) is not cited in the main text

Fig 1: This figure is difficult (impossible) to read, even at 200% zoom on a large screen. Please enlarge the text in the maps.

Fig 1B: Add north arrow to map 1B.

Fig 1C: The X-axis makes reference to the town of Zumbo which is not indicated on any of the maps.

Fig 1 caption: (C) The main channel change to: (C) Long profile of the main channel

Fig 3: Discharge values are not easily readable. Please include in these values in the figure caption rather than on the images.

Fig 6 caption: Comparison of effective discharges âĞŠ Comparison of observed and simulated effective discharges

Fig 6 legend: Amsler et al., 2005 change to: middle reach (Amsler et al., 2005)

Fig 6 legend: Castro et al., 2007 change to: lower reach (Castro et al., 2007)

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