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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 #1

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It was a great pleasure to read and review the article "Opportunities from low-resolution modelling of river morphology in remote parts of the world" by M. Nones and M. Guerrero. It presents an approach to simulate sediment transport and river bed morphodynamics at large spatial and temporal scales using a one-dimensional (1D) hydraulic-morphodynamic model combined with a hydraulic geometry relation, which estimates river width on the base of discharge. The 1D model uses several simplifications including the kinematic wave and local uniform discharge assumptions. These simplifications combined with the hydraulic geometry relation make the complete approach very parsimonious with respect to input data. This strength of the approach is demonstrated by the application to two case studies in Africa and South America, in which detailed input data is not available.

The study is an interesting contribution. The lack of detailed input is a major problem for the simulation of sediment transport and river bed morphodynamics in many cases. Therefore, an approach such as the one presented by the authors, which is focused on parsimony concerning input data, may facilitate future studies and new scientific findings especially in remote parts of the world.

The presented approach would be an even more considerable contribution, if any data would be provided, which can be used to quantitatively evaluate the approach and especially its uncertainties. For example, this could be done by an application of this approach to a catchment, for which detailed data is available. The detailed data could be used to validate the results of the presented approach and to quantitatively outline and discuss the losses in accuracy due to the simplifications of the approach. Another possible way would be a detailed sensitivity analysis. In this, the uncertainties of the model inputs need to be quantified and discussed. Then, the parameter space determined by the input uncertainty ranges would need to be at least examplarily covered by simulations in order to quantify the resulting output uncertainties. These output uncertainties need to be discussed as well.

Among the input uncertainties, for which a quantitative discussion would help to evaluate the presented approach, are the following: (a) River width was estimated based on discharge in a simple power law relation as hydraulic geometry relation. What is the uncertainty of widths estimated by this method? (b) The hydraulic geometry relation is calibrated using widths, which have been derived from satellite images. What is the uncertainty of this technique to determine river width? In this context, it may be especially worth to discuss the differences between active width (i.e. the width, in which sediment transport takes place) and wetted width (i.e. the width, which is covered by water). (c) The spatial discretisation of the presented approach is large (50 - 80 km). Are the used reaches of that length homogeneous enough to be lumped in one unit? (d) The grain size distributions are estimated based on only few samples. The data from these samples is extrapolated to cover the complete study area. What is the uncertainty, which

such an extrapolation approach entails?

I hope these comments will be useful for the authors.

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? The data for the necessary quantitative discussion of the uncertainties of the presented approach is missing at the moment.

6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? Yes

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? As English is not my mother tongue, it may be worth to let a native speaker review the language of the manuscript.

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? No

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

15. Is the amount and quality of supplementary material appropriate? Yes

Minor comments and technical corrections are given in the following. However, as previously mentioned, English is not my mother tongue. Therefore, it may be worth to let a native speaker review the language of the manuscript. In general, British and American spelling conventions are mixed in the manuscript. The term "with respect to" is often used in the sense of "as compared to". All other comments are referenced by (x,y), in which x is the page and y the line(s).

(408,6) current: "high level of processes detail"; suggested: "high level of process detail"

(408,7-8) current: "depend on processes parameterization and calibration over detailed field data"; suggested: "depend on process parameterization and calibration based on detailed field data"

(408,16) current: "in light of climate variability"; suggested: "in the context of climate variability"

(409,17) current: "climate changes impacts"; suggested: "climate change impacts"

(409,26) current: "hydraulics equations"; suggested: "hydraulic equations"

(410,1) current: "extend the 1-D model"; suggested: "extends the 1-D model"

(410,6) current: "anthropic"; suggested: "anthropogenic"

(410,8) current: "substitute-support"; suggested: "substitute or support"

(410,13) current: "influence final results reliability"; suggested: "influence the reliability of the final results"

(410,17-18) current: "along the watercourse, although at non-detailed scale"; suggested: "along the watercourse at non-detailed scale"

(410,29) current: "correlated to dams impacts"; suggested: "correlated to the dams' impacts"

(411,8) current: "The removing"; suggested: "The removal"

(411,9) current: "the stabilizing"; suggested: "the stabilization"

(411,10) current: "the concurrent increasing"; suggested: "the concurrent increase"

(411,17) current: "climate variability effectiveness"; suggested: "climate variability's effectiveness"

(412,1-3) current: "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"; suggested: "a continuous and progressive oversimplification of the river channel planimetric morphology toward a lower width to depth ratio was observed regardless of the oscillation in hydrology"

(412,3) current: "Reasons of these different responses"; suggested: "Reasons for these different responses"

(412,4) current: "enlarge and decreases"; suggested: "enlarge and decrease"

(412,5) current: "These morphology constrains"; suggested: "These morphologic constrains"

(412,16) current: "flow-discharge variability was highlighted passing from"; suggested: "flow-discharge variability can be observed passing from"

(412,25) current: "can be divided up into"; suggested: "can be subdivided into"

(413,3) current: "The Upper Zambezi flows into Angola for about 250 km"; suggested: "The Upper Zambezi flows through Angola for about 250 km"

(413,4) current: "between the Upper and Middle reaches"; suggested: "between the Upper and Middle reach"

(413,9) current: "The Lower Zambezi is long about 650 km from the Cahora Bassa Lake to"; suggested: "The Lower Zambezi is about 650 km long reaching from the Cahora Bassa Lake to"

(413,10) current: "This reach is typified by"; suggested: "This reach is characterised by"

(414,1) current: "No more significant tributaries"; suggested: "No other significant tributaries"

(414,2) current: "downstream this confluence"; suggested: "downstream of this confluence"

(414,4) current: "a significant role in the LPB's sediment"; suggested: "a significant role for the LPB's sediment"

(414,13) current: "between 600 to 2500m and 5 to 16 m"; suggested: "from 600 to 2500 m and from 5 to 16 m"

(414,19) A reference for the Hirano equation might be useful.

(414,24) current: "the same slope, which is applied"; suggested: "the same slope. This slope is applied"

(416,8) current: "of flowing discharges"; suggested: "of water discharges"

(416,19) current: "were not providing evidence about"; suggested: "did not provide evidence of"

(417,6-7) current: "propagates towards the downstream direction"; suggested: "propagates downstream"

(417,10) current: "These modelling confirmed"; suggested: "These simulations con-

firmed"

(417,12-13) current: "This undisturbed trend resulted affected"; suggested: "This trend was affected"

(418,11) There is only a weak relation between the text, which discusses the variation of delta area, and the referenced figure 4b, which shows an satellite image of the delta.

(418,11-12) current: "by occasional water levels"; suggested: "by occasional changes in water level"

(418,15-16) current: "boundary conditions of"; suggested: "boundary conditions for"

(418,17) current: "provided in the research project"; suggested: "provided by the research project"

(418,22-23) current: "details about these datasets"; suggested: "details on these datasets"

(418,23-24) current: "a comparison among applied scenarios"; suggested: "a comparison of the different applied scenarios"

(419,12) current: "Whatever the analysed scenario"; suggested: "For any analysed scenario"

(419,18-19) current: "monthly flow discharges"; suggested: "monthly water discharges"

(419,26) current: "As far as concern the resulting morphology"; suggested: "As far as the resulting morphology is concerned"

(420,12) current: "few tents of centimetres"; suggested: "few decimeters"

(420,18-19) current: "which noticeable enlarges"; suggested: "which noticeably enlarges"

(420,25-27) The sentence "In addition, it is worth noting ..." does not contribute substantial information within the context of the containing paragraph.

(421,10) current: "related to"; suggested: "influenced by"

(421,12) current: "in remotes part of the world"; suggested: "in remote parts of the world"

(421,19) current: "less sensitive to inaccuracies induced by model parameters calibration" The basis of this comparison is unclear ("Less than what?"). Additionally, there is no comparison of parameter calibration sensitivity featured in the results section of the manuscript.

(421,22) current: "of processes parameterization"; suggested: "of process parameterizations"

(422,4) current: "which noticeable enlarges"; suggested: "which noticeably enlarges"

(422,10) current: "validation"; suggested: "calibration"

(422,22) current: "anthropic"; suggested: "anthropogenic"

(422,24) current: "from processes parameterization"; suggested: "from process parameterizations"

(435,Fig.8) The legend label "XX c." needs further explanation.

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