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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Sediment transport modelling in riverine environments: on the importance of grain-size distribution, sediment density and boundary conditions" *by* Jérémy Lepesqueur et al.

Anonymous Referee #2

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Review of "Sediment transport modelling in riverine environments: on the importance of grain-size distribution, sediment density and boundary conditions" by Lepesqueur et al.

This paper deals with improvements brought to the sediment transport module (SISYPHE) of the TELEMAC model by introducing multiple sediment sizes with specific densities, accounting for river bottom and banks contributions. The paper is well structured and easy to read. The introduction provides a relevant state of the art and clearly positions the study with respect to parent studies in the field of fine, short-term

hydromorphodynamic modelling. The modelling framework section mainly consists in describing the rationale of the coupling between TELEMAC and SISYPHE and ad hoc adaptations, without noticeable changes in the underlying physics of the models. The tested adaptations are put into practice on a single study site in moderate flow conditions, which although relevant seems a bit too limitative to explore all possibilities offered by the new formulations. The Results and discussion section is fair, most of the Figures and interpretations are convincing. I also rather agree with the conclusions and future scopes.

In my opinion this paper is worth publication for the improvements it describes to an already-validated and well-known modelling approach, even if this kind of contribution would have deserved a wider database of river contexts and stage conditions. In its present form it is more of a convincing feasibility study than a definitive proof. My second objection is that the 3D features of the model are rather "silenced" throughout the paper, at least not taken advantage of - maybe due to experimental difficulties (it is not easy to "measure" as many flow features as are predicted on these scales)

A few minor issues still need to be handled, listed in the following.

Title

"Boundary conditions" is not explicit enough for me - do the authors mean "upstream boundary conditions" or sediment availability on the bottom and river banks?

Abstract

P1L11 - I would rather say "the spatial pattern of particle distribution and density" instead of "particle site distribution and density" P1L13 - "rising and flood events" is a repetition P1L18 - It may seem somewhat tedious to only mention the upstream condition while a downstream control also exists, as Fr«1 most likely almost everywhere. However, this point is mentioned here and there in the paper and I don't know if it should be recalled/announced here.

Introduction

P2L19 - "erosion, transport and deposition" by chronological and phenomenological order (and also P3L13) P2L20 - I think the reader deserves a bit more tips on the reason why "those two parameters control the area where..." P2L25 - Could the authors provide additional indications regarding the conditions of the Durafour et al. study? P2L34 - "first" instead of "First"

Modelling framework

P3L14 - "which" instead of "and" before "allows" P3L26 - I thought z1 was a "fictitious" horizontal level - its definition here is pretty unusual and the sense of "deeper vertical plane" is not straightforward at least to me. §2.4 - The (high) probability of flocculation for cohesive sediments is disregarded and only mentioned in the future scopes. Could the authors provide insights on the flow regimes in which flocculation can be ignored or will certainly occur, thus outlining the conditions of validity of the present approach? In complement, I think the 63μm-limit is that between silt and the finest sand particles - this should also be mentioned. P4L25 - Value of M? Is ïĄţc0 ïĆź ïĄţcd and what are their typical values? P4L27 - Ws is not mentioned. P5L5 - "kinematic" instead of "cinematic" P5L17-19 - I think this section should be moved after the cases of cohesive and non-cohesive sediment have been described. P7L15-21 - Have you tried different upstream initial profiles or do you consider the one you chose is typical of pre-existing equilibrium conditions? If so, are the results only valid for such conditions?

Study Area...

P10L8-13 - These elements of discussion are fair and welcome but do you think the hypotheses assumed are strong hypotheses. Do you have any "independent" indications that your starting hypotheses are correct or are they just default hypotheses (or else, do the results drastically change if these assumptions prove wrong?)

Results and discussion

P12L26 - "The need for long simulations", does this hold for non-equilibrium initial conditions and if so, do you think it means the coupling is not strong or dynamic enough - as in quasi-static approximations for sediment movement, for example? P13L19 - Delete "slightly" P15L10 - From the point of view of physical processes at play, one may think that increased water stages and stream power would both dislodge and move heavier bottom particles and allow access to different sediment "sources" on the banks. Is it compatible with your approach or could it be described within it (for a stronger reconnection with experimental observations)?

Conclusion

P19L4-5 - It is unclear what boundary condition representation means

Future scope

P20L10-11 - It is not good practice to quote more than 5 references at once - please split the list and comment on the differences between studies and contexts.

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