

Interactive comment on “Predicting discharge capacity of vegetated compound channels: uncertainty and identifiability of 1D process-based models” by Adam Kiczko et al.

Adam Kiczko et al.

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Dear Reviewer, We are grateful for remarks, we hope they will allow us to improve the manuscript text. Below, we provide answers to reviewer comments:

1. L7-8 I think this sentence is not clear. Does this mean that the accuracy (rather than uncertainty) does not have to be considered?

Response: The sentence should be rephrased: “We developed a new probabilistic approach for comparing six models of channel discharge capacity in respect of their uncertainty. The model with the lowest estimated uncertainty, that explains

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differences between computed and observed values, should be considered as the most favorable.”

2. L18 (general remark on the Introduction section) The paragraphs and sentences need to be rearranged and reorganized to improve the flow. In the current form of the introduction section, ideas are scattered, and similar statements and descriptions are found at different places.

Response: If the manuscript is considered for the revision, we will improve the clarity of this section.

3. L120-121 The beauty of using a process-based method is that we may be able to measure or observe the values of its parameters (rather than calibrating them). The concept sounds like the authors treat the process-based methods as conceptual or black-box models. I agree with the idea that all models will become conceptual or black-box at certain spatial and temporal scale. Please discuss the theoretical background and implication of this method somewhere in the manuscript to more clearly contextualize this study.

Response: This issue is also raised by the third reviewer. With our study, rather than advocating for identifying in the inverse manner all possible parameters, we would like to discuss “what if these physical parameters are identified”. So, we agree that we should stress the advantage of physics-based methods and provide a better explanation of our view. The reviewer comment on the effect of spatial and temporal scales on physical meaning of models, is exactly the way how we consider application of these methods in practice. If the article is considered for revision, we would like to add a developed discussion on these issues.

4. Table 1: Please elaborate how these boundaries were determined (Tables 1 and 2).

Response: We adopted the uninformative a prior parameter distributions, however maintaining physical variability ranges of parameters. In an adopted pro-

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cedure, the width of a priori parameter ranges were wide enough to reflect the total model uncertainty. This was obtained by trial-and-error with the objective to ensure that the high probability region of the final solution is enclosed within these bands. If applicable, we will provide a much more detailed description of this procedure.

5. Table 1: The sizes of samples are different depending on the models (and the numbers of their parameters), but I could not find any consistency. Please elaborate how the sizes were determined.

Response: The reviewer is right, we estimated the number of Monte Carlo simulations, by analyzing the convergence of the water depth mean. Such an explanation should be given in the revised article.

6. L375 I think the use of a more advanced sampling technique such as the Latin Hypercube sampling can help cover the extremes.

Response: The reviewer is right, hopefully we already used Latin Hypercube sampling (uniform). The information should be given in the text.

7. L376-377 This is also a function of the size of the Monte Carlo samples and the parameter value boundaries determined in Tables 1 and 2.

Response: Our goal in designing a prior parameter ranges, was to ensure, that the solution is independent of a priori parameter distributions. This was a reason for uninformative parameter ranges and relatively wide ranges: to ensure that a high probability region is enclosed within the whole sample. More detailed explanations on that matter should be included in the revised manuscript.

8. **Figures:** Figures and tables should be located right after paragraphs that first mentioned them in the manuscript. I found many of the paragraphs are not followed by the corresponding figures and tables.

Response: We will work on the manuscript layout.

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9. L539-541: It should be useful if the authors can discuss the hydraulic background and implications of this finding.

Response: This applies to the case with dense and flexible vegetation. According to our results, this well agrees with the assumptions of GTLM model, which very well in terms of accuracy, explains the rating curve. Also, the PTLM had good performance and only of two layer approaches, the STLM, where vegetation flow is neglected, had a poor accuracy. We think, that the comment in the manuscript can be developed.

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