

# ***Interactive comment on* “Reducing uncertainty bounds of two-dimensional hydrodynamic model output by constraining model roughness” by Punit Kumar Bhola et al.**

## **Anonymous Referee #1**

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### General Comments —————

Thanks for this interesting and informative paper. In general the paper was easy to read, well-structured and complete. The topic of the paper fits to the scope of Natural Hazards and Earth System Sciences in this case to flooding and inundation. The content is relevant to the scientific community and gives substantial contribution to the knowledge in this domain.

The paper is in his core a case study for a specific flood event in Germany. I recommend to specify the natural hazards and target of the 2D modelling (flooding/inundation) in the title. A generalization of the method to other case studies or

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other application scenarios would be beneficial for the reader. This could be done in a minor or a major revision. However, the conclusions of the work done should be described and highlighted beyond the model case study in Germany as added value for the reader of the paper. The question, in which way the paper can help other modellers for other case studies, should be answered explicitly.

Detailed Comments \_\_\_\_\_

Page 2 line 11 The coefficient is either measured in the field -> How did you measure the Manning coefficient in the field ? I think the coefficient is not measured but derived from measurements. see same page line 15 -> "therefore, it cannot be measured exactly"

Introduction The spatial distribution of the roughness (e.g. in the river bed, in flood plains and in areas with inundation), is missing in the introduction, maybe you can add 1,2 sentences to clarify this problem/challenge.

The last sentence about the case study in Kulmbach is too short, reading up to here, it is not clear how the flood is triggered (heavy rain -> flash flood in the city, river flood wave inundation, ...) maybe you can add some key words / numbers to classify the case study area in more sentence to characterize the type of flood case study. 3.1 will give the details later

Page 4 line 15 Please add the term "site" in the sentence, as the 8 bridges are shown as site 1-8 in Figure 1. line 16 Please add a reference to the levelling instrument Ni2 and add some numbers to "high accuracy".

line 26 Unterzetzlitz is not mentioned in chapter 3.2 as "previous section", please add a sentence in 3.2 as only Kodnitz and Kaurndorf are mentioned and only these two hydrographs are shown. Maybe the discharge of Red Main / Unterzetzlitz is not critical for the flooding area, but if you mention it in 3.3 the information should be complete

line 28 What is "high-quality" DEM, please mention the resolution e.g. in m and how

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this is represented and combined in the numerical mesh (terrain, river bed) ?

Chapter 3.2 the time steps given in table 2, assuming it is a global time step. I'm missing in the paper the simulation period (2,5 days ?) maybe one sentence about the required time for one simulation on a specified hardware would be also helpful. Not everyone is reading your two papers 2018a and 2018b before reading this paper, as only 2018b is available at the moment

Page 5 line 2 Why did you performed 1000 simulations, not 500, not 2000, please add a sentence to validate the number of performed simulations

line 6 What is a "simple" model ? Is there any model reflecting the "true" distribution of the parameters ? what is the "basin" ? Do you mean model region/area ? line 11 cotton fields and small boulders are confusing here

Page 6 line 6 I instead of II (2\*II)

line 3 ff This sentence is not clear for me: The sites are located at bridges in the water bodies, this is clear. But the water level is less depending on the landuse at the location more on the upstream flow situation, which type of landuse is there and how much area is flooded (besides water bodies) at upstream. In Figure 2 is shown that the main upstream landuse is water body and agriculture and only for extended inundation small areas of forest, urban region and transportation -> as there is no Figure with a DEM or with a typical flow situation (flood map), the impact is not clear except for site 1. I propose to add at least one flood map to argument for this sensitivity. As all this is important for interpreting the Figure 5 (a) - (p), maybe a more detailed, structured description of the landuse impact to site 1-8 might be helpful. If finally only two roughness coefficients are sensitive (as first result of the analysis), why the three other parameters has not been eliminated for a 2nd step to rerun the 1000 simulations (with two parameters only, maybe less simulations are needed) and to concentrate on the changes of these two parameters in the parameter sets?

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Page 7 The conclusion is more a summary and a outlook, but no conclusion. A generalization of the finding is missing, in which way the reader can benefit from this study ? Are there recommendations to do a similar approach in similar case or a general guideline to reduce the uncertainty bounds for flood modelling

What is the consequence for the flood modelling for the city of Kulmbach ? Maybe this question can be discussed in Chapter 4. I can follow the description in Chapter 4, but I missed the consequences for the modelling tasks.

Page 8 line 13-15 the short-cuts for the authors should be not used, who is BGM ?

Figure 1 Why did you not use the full width of the page? the figure size could be increased

Figure 2 1st image is fine, but difficult to discover the river bed without zooming in

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