Author's response to the Associate Editor's comment

We really appreciate the time and effort you have dedicated to providing insightful feedback on ways to strengthen our paper. We have a full and thorough understanding of the points raised by the Associate Editor.
In this revision, we essentially reorganized and improved the chapter 3. Particularly, this time, we try to present the observations from the experiments in 3.2, then the results from the model in 3.3, and the comparison is moved to section 5.1. In addition, some discussions in section 5.2 are moved to chapter 1 to clarify the position of the present method, and the relationship to previous attempts from the literature. Also, we added a paragraph to start in general what we want to achieve in each section.
We hope that this revision will address the points raised by the two reviewers and the Associate editor and move the manuscript forward for publication.

Associate Editor's comment

I have now received two evaluations of the manuscript, from the original reviewers. Both laud your efforts in improving the paper, and suggest that although the paper got closer to the final version, some further work needs to be done. Reviewer #1 thinks the balance between field and lab work needs to be improved, and asks for further information in particular on the lab work. Reviewer #2 makes a similar comment, and requests some further clarifications on the new model, and the relationship to previous attempts from the literature.
On the latter point, I actually think some of the points you currently make in the 2nd chapter of the discussion present the motivation for the new model. In particular, I would suggest to move some of the text to the introduction. You can briefly introduce the lagrangian approach of previous models in the introduction, state (as is in the discussion at the moment) that this prohibits the simulation of large, complex events with many individual pieces, and that you are striving for a model solution closing this particular gap.
Generally, I think you can try to better separate methods, observations and interpretations, particularly in chapters 3 and 4.
In chapter 3, on the experiments, I think the major problem arises from an unclear distinction of model and experimental results. Here, I suggest to reorganize the writing, first presenting the observations from the experiments, then the results from the model. The comparison can be moved to the discussion. Further, I think it would help to precede the chapter with a paragraph stating in general what you want to achieve.

Similarly, you could start chapter 4 with a few sentences introducing the purpose of the comparison.

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Comment from Referee #1

I appreciate the work that the authors have put in to better explaining their research and better justifying their statements. This revision goes a long way towards making the article understandable to a wide audience. Given the substantial revisions, I reread the article and commented on it in its entirety rather than focussing on my past comments.

This new version is much stronger, but some of the figures are still of lower quality and the explanations are not always clear. The addition of the laboratory experiments could be used to better explain the physical interpretation of the model results to contrast it with the Lagrangian models that are available. I think the work has value, but you need to better explain how wood is modelled as a depth. I would also put more emphasis on the result that the inundation limits and (possibly) the changes in channel bed elevation are best captured by including the wood effects in the model. From what I can see, the model without the wood misses some key details that are critical for predicting the flood hazard, so this is an important result.
I also recommend a review of the language to ensure that the meaning of the sentences are correct in English. The researchers have improved this part substantially, but there are still some points of confusion.

Author's response to Referee #1

We really appreciate the time and effort you have dedicated to providing insightful feedback on ways to strengthen our paper. As for the depth in the wood modeling, we totally reorganized the chapter 3 to investigate the erosion and deposition of large wood. As we emphasize in this revision, we assume two major factors that affect calculation results: the exchange of the large wood between the water and the bed and wood entrapment on structures. To investigate the validity of these factors, we compare the flume experiments and the calculations in chapter 3.
Also, as for the language, this time we asked an English proofreading specialist to review the manuscript to ensure that the meaning of the sentences are correct in English. We hope that this revision will address the points raised by the reviewers and move the manuscript forward for publication.

The answers to the specific comments are as follows;

32 – this description could be clearer. You are trying to separate the upstream and downstream processes, roughly divided into hillslope and debris flow type processes and flood flow and erosion of sediments and wood from the colluvial and fan deposits. I think you should be clearer to name the areas where deposits occur from the first set of processes and from the second set. I would like some idea of the size and steepness of the basins delivering sediment and wood to the main channel. I would also like some idea of what you consider to be the main channel. Could you use stream order to help differentiate? It is not that big of a basin, so I find the idea that the processes are so cleanly separated to be unlikely.

Answer:

We reorganized these points in the manuscript, using the idea of stream order.

75 – not sure if you mean 'field' rivers? I think you can just say 'rivers'.

Answer:

We modified it.

98 - maybe just mention that this determines the energy lost from solid particle collisions. What value is used for this?

Answer:

'e=0.85' was added in the manuscript.

113 - based on your response to the comment from previous version you should say that the buoyancy of the wood is considered with deposition. I know you later describe that the r value is also used, but I think it needs to be said here. The discussion of the shallow depths whoudl occur in this paragraph I think rather than at line 136

Answer:

We also added the explanation for the exchange from the neutral buoyant particles to the wood pieces at around the lines from 112 to 120.

136 – 'Meanwhile' not needed

Answer:

We removed it.

143 – what do you mean by the 'hidden' effect? Do you mean a feedback?

Answer:

We replaced ‘hidden effect’ by the ‘shielding effect’

151 – vague statement that the ‘applicability of the method is investigated…” Does this mean it is being validated or calibrated? Or is it more of a qualitative investigation of 'applicability'?
Answer:
We modified the sentence as follows: The validity of the proposed method is investigated by comparing the past flume experiments conducted by Itoh et al. (2010) and the calculations that reproduce the flume experiments.

197 - I don't follow the logic here. How are the flume experiments being used to validate the model? It seems that you are adding obstacle rows to observe the effect it has on log capture, but I don't see how this validates the model.
Answer:
We substantially modified this section 3, and the comparison between the experiment and the calculations are added in Section 5, the new Figure 17.

245 – here I don't think you mean validated. I think you mean estimated, or assumed based on the neighbouring Kagetsu basin. Validation is a procedure for testing statistical fits with a model after having calibrated the model.
Answer:
To be precise, the model parameters were calibrated using the Kagetsu river basin data, which locates east of the study basin, and the parameters are applied to estimate the flow discharge in the Akatani river basin. We added the sentence in the manuscript.

257 - It does help to show the boundary conditions over time as you have done in Figure 11. These are key to the model and difficult to constrain. At the end of the section it would be good to acknowledge the uncertainty of these predictions and state, as you did in your review, that these BCs are hard to validate but that they appear to be reasonable based on the information that you have. You could also emphasize that the model is sufficient for the overall purpose at this point, which is to model the spatial distribution of wood in extreme events where there is not much data and to include the effects of the wood in flood prediction, which is by far your best validation.
Answer:
We added the sentences at the end of chapter 4.2, following the important comment.

287 – the last sentence of the paragraph remains very broad that I find is not sufficiently

supported. How is ‘generally consistent’ defined? Is it just the visual comparison you are basing this on?

Answer:

We removed the ‘very broad’ sentence from this paragraph, and the comparison of this figure is moved to chapter 5.

297 – is there a post-flood scan of the bed that you could use to assess modelled bed elevations? The wood impact is clearly significant at a could of the bridges. Is this what was found in the field after this flood?

Answer:

We added the post-flood measured elevation, and added some relevant texts.

334 – ‘can elaboratelyl evaluate’ phrase is not clear. Maybe just ‘detail’ used as a verb?

Answer:

We modified the sentence as follows;

Previous attempts can accurately analyze the behavior of large wood by tracking individual pieces of wood.

338 – poor sentence. ‘Thus this method must be effective for such cases’ is not clear.

Answer:

We removed the part.

363 – what about the lab experiments? Why are they in there and how do they support your conclusions?

Answer:

We added these points in the manuscript.

Figure 4 - low quality figure. No scale in diagram, no indication of parts a and b. Presumably they are side view and top view, but this figure could be better.

Answer:

We improved the figure.

Figure 5 - more information needed in caption. Which run is this? I don’t understand the units. Wood deposition calculated in mm should be given a physical interpretation.

Answer:

The new Figure 6 (Figure 5 and 6 are exchanged) is improved in the legends and captions.

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Comment from Referee #2

Dear authors,
I think your ms has been ameliorated compared to the previous version, and now it is nearing a valuable contribution to the understanding of the challenges involved in wood transport modelling during floods.
However, I find the revised ms unbalanced between lab and field work, as the results from the lab work - which should convince the readers about the validity of the model applied to the Akatani River - are too poorly presented in my opinion. Figures on this part (4, 5, 6) are not that helpful in my view. Overall, I am not really sure this lab part helps the paper, to be honest. To achieve this goal, a more quantitative analysis of model's prediction performances against flume data should be presented, and possibly less figures (and text) should be dedicated to the field case.
A minor comment regards the parameters used in Tab 3: soil density is 2650 kg/m3, but I guess here you meant sediment density? because soil cannot be without porosity.
Best wishes

Author's response to Referee #2

We really appreciate the time and effort you have dedicated to providing insightful feedback on ways to strengthen our paper. As for the comment that the lab part does not help the paper, this time, we totally reorganized the chapter 3 to clearly state the model validation. We added Figure 17 for a visible comparison of the experiments and calculations. Also, texts in chapter 4 are reduced in this revision. The 'Soil density' in Table 3 was replaced by the 'sediment density'. We hope that this revision will address the points raised by the reviewers and move the manuscript forward for publication.