Earth Surface Dynamics Discussions

Earth Surf. Dynam. Discuss., author comment AC2
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Reply on RC2

Daisuke Harada and Shinji Egashira

Author comment on "Method to evaluate large wood behavior in terms of convection equation associated with sediment erosion and deposition" by Daisuke Harada and Shinji Egashira, Earth Surf. Dynam. Discuss., https://doi.org/10.5194/esurf-2022-52-AC2, 2022

Answer to Anonymous Referee #2

We really appreciate the time and effort you have dedicated to providing insightful feedback for our paper. After perusing the reviewer's remarks, we found that there are several parts in which our intentions have not been communicated. For example, what type of disaster it was and that we are conducting this study to evaluate large wood behavior for such a disaster. In other words, we think your point that "a model should not be more complex than needed for its purposes" is a criticism because the 'needs' and 'purpose' are not well conveyed.

Therefore, in this revision, we have first made significant additions to Section 1 to provide a more detailed description of the disaster. For example, in the Akatani River disaster, it is estimated that approximately 19,500 pieces of large wood were produced by landslide and debris flows, and that large amounts of sediment and large wood were supplied to the river. Thus, an appropriate evaluation of such large wood production, transport, and deposition process is the most fundamental aspect of numerical analysis for this event. The channel winding in Fig.5 took place due to the sediment deposition in the valley bottom, that is also clear from Fig.10, thus we hope the reviewer understands that bank erosion process is not a major factor that the authors intend to discuss.

We also believe that the bank erosion is one of main causes for large wood pieces. Equation (4) normally evaluates bank erosion in which x- and y- components of bed-load rate are evaluated by the bed shear stress and the velocity in the vicinity of the bed where the secondary currents are produced due to curvature of stream lines, and thus the source of large wood is evaluated by Eq. (16) and (17) in case erosion including bank occurs. Thank you for your valuable comments in this regard.

In response to the comment about the lack of explanation of the upstream end boundary conditions, we have made significant additions to Chapter 3.2. Indeed, we would like to write so much in chapter 3.2 that it should be a stand-alone paper, but that would make the paper too large. Therefore, we revised the chapter so that it makes some sense only in this paper. Regarding the point, 'Several different wood input scenarios should have been tested at least, integrated with bedload transport scenarios', please understand that we have performed parameter calibration to match the observed collapse area and large wood runoff estimation, as we have added in chapter 3.2.

We understand that your criticisms about the validation of the model, especially the lack of statistical discussion, that is what we need to pursue in the future. On the other hand, we hope you understand that it is not easy to obtain data on such disasters. For example, it is not easy to obtain data on the spatial distribution of large wood deposition after a disaster, because some large wood is buried under sediment. Indeed, purpose of the present paper is to show the concept of convection equation to analyze the large wood behavior and its applicability to such extreme disaster. We understand that there are issues that need to be addressed in the future, including the large wood capture at the bridge (Dirac delta imposed = 1).

Finally, we appreciate your insightful comments again, and the revised sentences are marked in the revised manuscript.

Best regards;