Review of "Geospatial modelling of large wood supply to rivers: a state-of-the-art model comparison in Swiss mountain river catchments"

Reviewer 2

Dear Authors, I have really enjoyed reading your ms, which I think represents a very valuable piece of work for improving the quantitative estimation - and most importantly the knowledge about related uncertainties - of wood fluxes during flood events. In my opinion, the text is generally clear enough and figures/Tables quite informative. I just have a few suggestions to improve the work, as listed below:

Response: We thank the reviewer very much for the time to revise the manuscript and the positive comments that helped us to improve our work. We replied to each comment and made the changes in the text accordingly.

- in the description of the FGA, I think it would be useful for the reader to have the relationship between the max distance and slope steepness for the landslide "connectivity" assessment. At the moment it says just "further away if slope >40% (line 318). But how far upslope? this is an important parameter, I believe.

Response: we clarified this point as follows:

Lines 315-318 (original ms) "Trees located in a landslide-prone pixel or within the toppling influence area (defined as a buffer equal to two times the tree high; here 100 m) may reach the channel if they were close enough (Euclidean distance to channel network < 50 m), or further away (Euclidean distance up to 100 m) but on a steep slope (>40%)."

This is discussed in lines 546-554 (lines in original ms).

- for both EGA and FGA please make explicit whether for bank erosion the erodibility of the lateral channel boundaries are considered or not. In other terms, can the models exclude (or greatly limit) bank erosion inputs in case of bedrock banks? If I am not wrong this is not the case, and thus I suspect bank erosion contribution may be overestimated, especially in steep reaches by FGA as the use of the width ratio is related to channel steepness, but steep channels may be extensively bordered by stable bedrock areas. I think the authors may wish to discuss how the introduction of erodibile vs non-erodible areas for both models may improve the performance of models. Such an approach was introduced by Franceschi et al. (2019) in combination with the use of width ratios (whose values can be set by the users)

Response: The erodibility of the channel boundaries was not considered in the models. The reviewer is right, that this assumption results in an overestimation of the wood supplied by bank erosion. We discuss this aspect in the discussion (added after line 540):

"Moreover, the erodibility of the channel boundaries was not considered in the models. Anthropogenic elements like bank protections, check-dams, and bridges or the presence of bedrock may limit bank erosion and widening, and thus wood supply. This information was not available at the required resolution and spatial scale for the analysed river catchments, and thus we could not include it. This also results in an overestimation of the computed wood volumes by bank erosion, which could be more relevant in the FGA than in the EGA (for which the volume reduction coefficient could be more easily adjusted)."

- Unfortunately, Franceschi et al (2019) is not published yet, as you know. However, please not that the preprint has a longer list of authors that those reported in the references. Please check it here "https://www.researchgate.net/publication/330397920_GIS-based_approach_to_assess_large_wood_transport_in_mountain_rivers_during_floods".

Response: we corrected the reference:

Franceschi S, Antonello A, Lucia Vela A, Cavalli M, Crema S, Tonon G, Comiti F. 2019. GIS-based approach to assess large wood transport in mountain rivers during floods. Preprint DOI: 10.13140/RG.2.2.31787.08480

Also note that this model accounts for both landslides and bank erosion inputs, differently from what reported at lines 625.

Response: We removed Franceschi et al (2019) from line 625, and edited the paragraph as follows:

Lines 624-627: "Most existing models simulate only one recruitment process (i.e., landslides or bank erosion) explicitly (Lucía et al., 2015a; Cislaghi et al., 2018; Zischg et al., 2018; Gasser et al.; 2018, 2020), and a few consider mass movements and fluvial processes (e.g., Franceschi et al.,2019). Yet, a model that simulates coupled processes to compute wood supply is still lacking."

In addition, Franceschi et al model is capable to work with single trees and thus provide statistics about number of elements and their size (For table 1).

Response: we added the following to line 706 (original ms):

"Unlike in the approach used by Franceschi et al (2019) or Gasser et al., (2018), who detected individual trees from high-resolution LiDAR data, in our case, there was no available information with the required spatial resolution to consider the dimensions, proportion of different species, or the stage (e.g., remnant or reforested) or the age of the forest stand."

- The authors should comment about the need/benefit for hazard prediction to model - in addition to the wood supply presented here - the propagation of LW in channels during floods (1D or 2D, including critical sections as bridges where most LW can get trapped), I think that especially for the larger basins the lack of propagation (and thus the longitudinal disconnectivity) may be partially responsible for the important overestimations showed in this study. I hope you will find my comments of use. Best wishes! Francesco Comiti

Response: The aspect related to the overestimation of wood supply and the size of the catchment is clearly shown in Figures 9 and 10, and discussed in lines 585-590. We added some lines to refer to the lack of transfer or propagation in our models:

"Another important aspect regarding overestimation of the computed wood volumes by the FGA and EGA is the assumption that the estimated volumes are supplied and exported to the outlet of the catchment, which may not be the case if the wood is being deposited along its way. The models do not consider the transfer of the wood along the river network (as for example the approaches by Franceschi et al., 2019 or Zischg et al., 2018)".

And also added some discussion after line 744 (original ms):

"The geospatial modelling results indicate areas of potential LW recruitment, however without precise information about the intensities occurring or the transfer and propagation through the river network."

And after line 742 (original ms):

"There is still a need to analyse and model the propagation of LW through the river network, by for example, applying hydraulic modelling (e.g., Ruiz-Villanueva et al., 2014) or the recently proposed network approaches as those applied to sediment transfer (Finch and Ruiz-Villanueva, 2022)."

Finch and Ruiz-Villanueva, 2022. Exploring the potential of the Graph Theory to large wood supply and transfer in river networks. EGU22-8232, https://doi.org/10.5194/egusphere-egu22-8232 EGU General Assembly 2022.