



EGUsphere, referee comment RC1
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Comment on egusphere-2022-377

Anonymous Referee #1

Referee comment on "River hydraulic modeling with ICESat-2 land and water surface elevation" by Monica Coppo Frias et al., EGUsphere,
<https://doi.org/10.5194/egusphere-2022-377-RC1>, 2022

The paper is a good example of how to use ICESat-2 satellite altimetry data in a hydraulic model built without in situ topographic survey of cross-sections. I found the paper interesting and adapt to the HESS journal. I think it deserves to be published after minor changes.

- In the analysis I have only one main concern that relates to the structure of the model without considering large tributaries. My main concern is the fact that you consider the boundary condition as uniformly distributed, but in fact from Figure 4 it is quite evident that there are at least two significant inflows from the two left tributaries (it is not clear whether the right tributary comes upstream or downstream of Jimay station). How did you simulate these significant inflows?

- Perhaps the organization of the article can be revised to avoid repetition and short paragraphs. In particular, the description of the ICESat-2 dataset and the study area follow the method, but they are actually mentioned again and again to explain the different steps. Therefore, I think the best solution is to describe the material first (satellite and in situ dataset, study area) and then the method so that the reader is able to understand why the two satellite products and the hydraulic model scheme are used.

SPECIFIC COMMENTS:

- Introduction: references on hydraulic simulations should include at least one of the studies conducted by Domeneghetti et al. (2014, 2015, 2020); references on altimetry densification should include the publication of one of the authors Nielsen et al. (2022).
- Lines 119-125: the numbers are rather arbitrary. Please, justify the reason for these thresholds in the main text (93% for the water occurrence; 15 m from the river center-line; 500 m distance between observations and less than 15 times...).

- Lines 132-138: I'm not sure I understand these lines. What is meant by "the reference water surface elevation of the cross-section changes "? If it is a reference, it should be fixed. And what is meant by "the change in flow rate is added to the corresponding depth of the cross section"? How can a flow discharge be added to a depth? Please, rephrase the sentences so that they are clear.
- Line 141: it is not clear why the two products ATL03 and ATL13 are shifted of 41 cm. Is this explained somewhere in the manuscript? If not, please can the authors add the reason of this bias?
- Lines 142-148: Please, explain the concept better. It is not clear why you are removing the red dots in Figure 3a that correspond to the zero change in discharge, or the dot at 400. In fact, I do not understand the logic of these analyses. Perhaps, they deserve more detail in the text.
- Line 212: remove "the"
- Looking at Figure 5 the shape of some cross-sections looks rather unrealistic (c,d,e,f). The river bottom looks high (shallow) and this could affect all the analysis. Do you have information on the topographic survey of some cross sections that could help to understand how much error is in the bottom estimate?
- Please, define all acronyms: e.g. RHS, UPA, Obj
- It is not clear why the paragraph 2.4.2 is described here and what is the role after. Try to explain why you are using the MIKE Hydro model.
- Line 290-294: For a reader who is not thoroughly familiar with the satellite product, this sentence is difficult to understand. Please try to explain what is the difference between weak and strong beam data. Also, since this is a product feature, I think it can be moved to a methods section.
- Line 296-297: please, add the references for these distances (e.g. cross-section chainage and longitudinal distance).
- Line 320-321 the sentence is not clear. Please, reformulate it.
- Line 333: the biggest errors are in the downstream sections because I think the estimated bottom of the river is too high. Can I see some cross-sections in the stretch from 65000 to 68000?
- Figure 13 a: please specify the Depth coming from Mike 11 and Depth coming from ATL13 in the x-axis and y-axis. Are you able to explain the differences between the simulated and satellite observed WSE in the July-August 2020?
- Lines 384-385: do these studies refer to the same study areas? Please, specify.
- Line 439: please clarify this sentence because the paper does not show any comparison with other satellite missions to be stated that it "performs better than previous altimetry missions"