We thank the reviewers and the editor for their insightful comments and suggestions to improve the manuscript. Below, we copy reviewer #2 comments in grey font and our answers in blue font.

Comments referee #2

Dear authors,

Thank you for this revised version of your article. I appreciate the revision work that has been done seriously, with addition of graphes, analysis and rewriting. I provide some specific comments below for minor revisions.

Kind regards,

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Comments :

Could you add some more clarifications in introduction regarding the problem of bathymetry-friction estimation in hydraulic models, from water surface observations especially in altimetry context. After line 80 and before your paragraph line80-90 on inverse problem, please clarify what is a calibrated hydraulic model - classically bathymetry is assumed to be known and friction is calibrated, spatially uniform in most cases, spatially distributed in case enough WS data available (and forward/inverse algorithm enables it...); next briefly explain the issue related to estimating uncertain/unknown bathymetry-friction (cf. for example Pujol et al.) ; equifinality issue... You should mention in this context the use of a bathymetry shape parameterization as you use, that is a parameter space reduction compared to estimating a "full" bathymetry.
The order of the introduction has been revised to highlight these aspects of the problem. Some discussion on the bathymetry-friction estimation is been added, and the advantages of using bathymetric observations from ICESat-2 are clarified.

l330. you should clarify that the steady state hypothesis is reasonable given altimetric snapshots.
The hypothesis is reasonable after filtering ATL13 observations and comparing discharge variations with WSE variations in sections 4.1.3 and 4.1.4. We have clarified this at the beginning of section 4.2

Is eq. 4. definite for multi-regimes flows, i.e. fluvial, critical and torrential flows. You can say that one can assume fluvial flows, i.e. Froude<1, in an altimetry context (cf. Garambois and Monnier).
In Eq 4 we assume subcritical fluvial flows. It has been clarified.

The river stretch is roughly west-east and crossed "orthogonally" by satellite tracks, what about briefly discussing the transposability of the method to other rivers, especially for north-south reaches?
The method works best if rivers that are west-east oriented. However, also primarily north-south flowing rivers will have local sections with west-east orientation. Because ICESat-2 tracks are so densely spaced, there is still a fair chance to find usable cross sections in the ICESat-2 record. We have noted this in section 2 Study Area and added in discussion section 6.1.

In abstract/intro/methodology please clarify that your calibration parameters are spatially uniform (in 5.2 : "uniform low-flow depth, and Manning's roughness, correction factor α, and cross-section form exponent r ").
It has been clarified that the calibration is for spatially uniform parameters.

l95 ; modulate please ; swot will be more than a low resolution mission.
The sentence is modified

I suggest you use the word "friction" instead of roughness in your work ; it is the parameter of an empirical friction law in the hydraulic model of interest.
In our work we calibrate the Manning roughness coefficient n, which is used to parameterize the friction slope. We believe that friction is the right term when referring to the force acting on the flow, but roughness is the correct term when referring to the material bed property that causes friction.

§ 4.1.4, \Delta Q computed with simulated discharge ?

Delta Q is computed with discharge observations at the in-situ stations, for the corresponding acquisition date. This point has been clarified in the corresponding section of the paper

l369 and elsewhere use the word compute instead of calculate for numerical computations.
Calculate is replaced by computed in the new version.

l406, "comes from the lateral inflow, " for which measurements are not available
The sentence was corrected.

l634, "400", typo?
Yes, removed

l710. "Previous studies on hydraulic calibration used hydraulic signatures from satellite remote sensing measurements, but they did not include cross-section geometry (Bjerklie, et al. 2018, Pujol, et al. 2020)". You may clarify they also used simplified geometries (rectangular in Pujol, which is the simplest power law parameterizaiton, rectangular+trapezoidal cross section geometry is used in Garambois et al. 2020 on a braided river). You can say that they used simple cross section parameterizations, with rectangular low-flow channel while you use a non trivial power law parameterization.
We have clarified that these studies used simplified geometry. The novel aspect of this paper is that we use observed cross section geometry from ICESat-2 as much as possible. Only the small submerged portion of the cross section is parameterized using generic shape assumptions. We chose the r-channel for this here, but of course, other models could have been used too. We do not think that the use of the r-channel is a novel aspect of this paper.