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

This work presents the calibration of a 1D hydraulic model on ICESat-2 altimetric data, for a river portion with unknown bathymetry friction and given discharge upstream and downstream, which is an interesting topic. The calibrated parameters lead to fair performances in terms of fit to observed water surface elevations (WSE). The parameter space representation and sensitivity analysis are pertinent.

However the scientific novelty of the study and scientific positioning is not sufficiently clear, the authors omit lots of recent works about inverse hydraulic-hydrological modeling with current altimetric and water extent data, and forthcoming SWOT data.

I recommend the authors thoroughly rework the manuscript, rewrite the introduction and sharpen the analysis of results, reoganize some parts to ease the reading. I provide some elements below.

This work relies on:

- ICEsat-2 data, preprocessed using water masks and an effective parameterization (from Dingman) for unobserved low flow cross-section bathymetry. (which has been used with altimetry and hydraulic modeling in Bjerklie et al. 2018).

The work by Bjerklie et al. 2018 uses ICESat data, which has a footprint of 70 m, while ICESat-2 has a footprint of 12 meters. The improved resolution of the data product offered by ICESat-2 which was launched in 2018 creates an added value when measuring cross-section geometry.

- a 1D steady state Saint-Venant shallow water model with 3 spatially uniform parameters (Manning friction, low flow depth, power shape) used in the calibration process. Rerun with calibrated parameters and unsteady solver in the MIKE platform. (Other 1D hydraulic models are used with altimetric data and effective bathymetry parameterization in references provided below).

- a global calibration algorithm and a global sensitivity analysis algorithm, both from literature are used.

I require clarifications and improvements on these points:

- No real analysis about the hydraulic inverse problem from satellite data, and of the scientfic difficulties related to it as the "bathymetry-friction" equifinality (Garambois and Monnier 2015), existing elaborate algorithms including variational data assimilation used for high dimensional calibrations and adapted to satellite hydraulics (cf. Larnier et al. 2020, Garambois et al. 2020 and references therein).

The new aspect in this study is the use of ICESat-2 data, and not the hydraulic inverse modeling workflow as such, which is essentially equivalent to the one presented in https://doi.org/10.1029/2020WR029261. We will improve the background sections on hydraulic inverse modeling in the manuscript and extend the referencing.

In our study, the uniform roughness calibration gives better results than the distributed roughness calibration (see Apendix A). The results will be discussed and compared with the ones in the proposed in the literature.

- Model derived rating curves (and even stage fall discharge relationships, with WS slope...) have already been presented and thoroughly analyzed in Malou et al. with a hydraulic model calibrated on altimetry and water extents.

Will be compared and discussed with the results of Malou et al. Again, the point here is to show how the suggested workflow can combine spatio-temporally distributed ICESat-2 observations into time series of discharge and/or WSE at specific chainage points.

- It is not clear to me how much snapshots of WS are used, what about temporal variability? Is there any nadir altimetric time series available on this study zone? The only validation regarding temporal variability is thus at gauging stations used as boundary conditions for the hydraulic models?

The WSE snapshots correspond to 236 ATL13 products which contain 3199 water surface elevation points. After filtering and averaging for close observations, we calibrate with 81 WSE observations (see section 3.1.2). The temporal variability includes measurements from November 2018 to September 2020 for the calibration period, and from December 2020 to November 2021, with data covering the low flow and high flow season. This will be better explained in section 3.1.2.

There are a couple of VS available in the Hydroweb database which can be used to compare results. However, the river reach is very narrow which limits the quality of the VS time series.

- Hydraulic analysis are not deep enough, regarding forward-inverse hypothesis and resulting misfit wrt observations and river morphological features, regarding also "WS interpolation at any river point" as mentioned in the flowchart of Fig 1. Detailed discussions about hydraulic extrapolation in altimetry context can be found in Pujol et al. 2020, Malou et al. 2021.

We will improve the hydraulic analysis and discussion in the revised manuscript. However, we would like to emphasize again that the new aspect of this study is the use of ICESat-2 datasets and not the hydraulic inverse modeling workflow as such.

- An algorithm enabling Bayesian uncertainty analysis is used "To study the uncertainty of the model", the uncertainty is provided on infered parameters but not on other estimates in the rest of the paper ; analysis are not deep. What is the sensitivity of the parameter inference to first guess, to pdf choices and other calibration algorithm parameters?

A more comprehensive uncertainty analysis will be added to the revised manuscript.

- Is "80-180 meters in low flow season" corresponding to a narrow river? This corresponds to rivers visible with current nadir altimeters and by the future swot mission, which should be properly discussed with a literature review.

These values correspond to low flow season. The quality of the nadir altimetry time series available for this river reach is relatively limited, which shows that ICESat-2 can make a significant contribution here. SWOT may deliver good data on this reach in the future, but such data is currently not available.

We will extend the discussion of these aspects in the revised manuscript.

- Clarify UPA_{x} in Eq. 7.

Will be added.