Anonymous Referee 2

I was Anonymous Referee #1 for the previous submission of this paper (https://egusphere.copernicus.org/preprints/2024/egusphere-2023-3118/). The paper has been reworked so that the proposed DoubleManning approach (unchanged) is better positioned among other rating curve methods reported in the literature. Another reason for commending the authors is that the paper writing and presentation are excellent. Data and software codes are made available.

We send our thanks for your re-review and for the positive notes here.

The rationale of the proposed method is meaningful. However I'm still sceptical about its novelty and practicality: the Divided Channel approach is classic (cf. the plentiful literature on compound channel flows), as well as segmented rating curves (eg. Rantz et al. 1982 for USGS procedures). As now stated in the article, Bayesian methods allow for the prior specification of the physical parameters of channel controls, similar to what is done here (arguably in a more natural and simple way), to constrain and compare the results. And they account for data uncertainty and provide result uncertainty, a big difference not really stressed in this paper…

We also fundamentally agree with you here. Furthermore, we hope that our responses to comments by Anonymous Reviewer 1 provide additional background to some of the benefit in including geomorphological constraints – which we argue here provide real help in understanding and interpreting the results. We see this as a proposal of a formulation. If the formulation proves valuable, then the next step can be to incorporate it into a more powerful inversion method.

In brief, in spite of the lack of novelty and practical usefulness, the offered method and tool are possibly worth a technical note, at least for the discussion of interesting ideas. I provide the following comments that may call for some improvements of the text and arguments.

Thank you for the support, and for "in spite of the lack of novelty and practical usefulness", which made me smile. I argue that including some standard fluvial geomorphic principles and measurements is (unfortunately) novel when considering rating-curve development, and the double-Manning approach translates this conceptual model into a field-ready, if somewhat straightforward (though this is not always bad), numerical solution.

The addition of two Manning equations does not account for head losses due to friction between main channel flow and floodplain flow. This effect is included in most 1D hydraulic models for instance. At least a discussion of this approximation and its possible consequences would be interesting.

Interactions between flows in the main channel and those on the floodplain are good point to consider when computing flow velocities along different points in the cross-channel orientation. Momentum will, as I think you imply, mix between the slow floodplain flow and the fast channel flow, speeding the former and slowing the latter. Because our goal is to solve for overall discharge, these exchanges balance, though the faster near-bank floodplain flow can therefore experience more frictional resistance. We will make note of this assumption.

It is unclear how (obvious) correlations in parameter estimates are handled: depending on the studied case, some parameters are fixed and others are let free to be calibrated. This appears to require some significant expertise from the user.

Yes: The user is expected to be familiar with open-channel hydraulics and fluvial geomorphology, and to ideally have obtained data to help inform the modeling (e.g., slope, channel width, bankfull depth, bed-material grain size). The data obtained can inform which parameters to constrain and which to vary.

The 3 examples are useful but they also show that the use of the method is not straightforward, as it requires adapting the modelling strategy to the amount of information available in the data and in the prior knowledge on channel and floodplain. Summarizing a general workflow applicable to any situation would be useful, in the end of the paper.

Summarizing a workflow does seem like a good idea. If it does not make this Technical Note too long, we refer users to the guide that we have written at https://github.com/MNiMORPH/doublemanning.

A decisive advantage of modelling the channel and floodplain as separate terms in the rating curve equation (i.e. the divided channel approach, as opposed to modelling the whole river section as a single term) is that the calibration of the main channel parameters still holds for overbank flows, which reduces the discharge uncertainty even when few or no discharge measurement exist for overbank flows. I have not seen such an argument in the paper.

This is a good point, and we did not think of it as something worthy to mention. We will include it. Thank you for the help in making the paper stronger.