Dear Reviewer,

Thank you for the comprehensive and constructive review of our article. We take note of your comments on the need to improve the clarity, discussion and recommendations for further work. We are willing to address these comments and improve the quality of the manuscript in a revised version, if the editor request us to do so. Please find below some answers to your questions and explanations on how we would address your comments. We have also provided some information about the project within which this study was conducted, including the groundwater monitoring part of the program. Our answers are in blue and your comments are in black.

The abstract does not indicate how transmission losses can be derived from a wetted river length. An additional sentence is needed for clarification.

Thank you for pointing that out, we will add a sentence in the revised version.

l110 'inland plains' is unclear. Is coastal plains what is meant, or is there some differentiation intended between an inland plain and a coastal plain? If so, some explanation is needed.

Yes, there is a distinction usually made in this region, mainly from a geological point of view. The inland plains represent the apex of the alluvial fan and are dominated by glacial and periglacial outwash, while the coastal plains are dominated by post-glacial alluvium and marine sediments. This leads to different aquifer characteristics within these formations, with a better defined vertical series of gravel aquifers, separated by clay and peat aquitards in the coastal plains (Larned et al., 2008; Taylor et al., 1989). We will explain that in the revised version.

l171 explain what is the difference between the river bed and the active river channel – how are these identified?

We used 'river bed' to refer to the gravel bed of the river and 'active river channel' to refer to the part of the river bed where the water is currently flowing. Examples of the wetted river length following the active river channel, the river bed and the braidplain are presented below in Figure 1. We could include this figure in the revised version, maybe as an appendix.

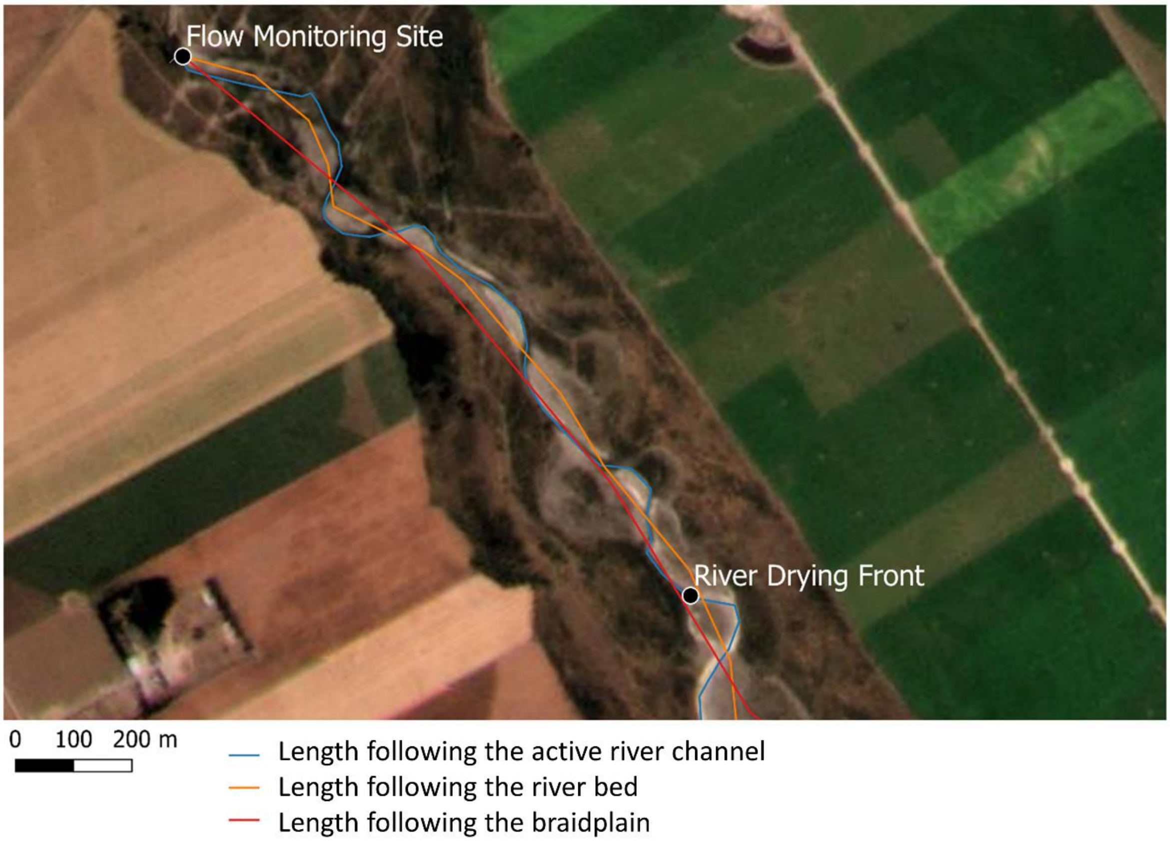

Figure 1: Wetted river length following the river braid plain, river bed and active river channel as considered in the study. The satellite image was taken on January 27, 2021, and the river drying front identified for this day is indicated on the image.

l181 the linear model fitted in App C masks some interesting aspects of the data, which need discussion. For example there are segments that show both strong gains at some times and strong losses at others. What are possible explanations and how do these effects reflect on the very simple assumption of a linear model? We need some process insights here.

Yes, there are some aspects of these data that we did not discuss in the submitted version of the article. The small-scale (between individual gauging) variability is due to complex interactions of surface flow with the shallow (perched) aquifer. The linear models were used to estimate average transmission losses over three riffle-pool sequences and remove the localized loss/gain variability. Thus, the average loss value can be directly compared with the transmission losses obtained from the satellite image approach, as shown by the results of the study. In the revised version of the manuscript, we will provide a cross-section presenting our perceptual model of the river-aquifers system showing the shallow (perched) aquifer (as requested by Reviewer 2) and discuss how this conceptualization can explain the data.

The small-scale interactions between the river and the shallow (perched) aquifer are currently investigated using their temperature signals and will be the subject of another future publication. Briefly, an important process revealed by this analysis is that some preferential flow pathways can be activated at high flow.

L186 what is meant by the transmission loss time series? Given the spatial complexity and the multiple measurements, this phrase is ambiguous without further explanation.

We meant the time series of reach-average transmission losses for the wetted reach downstream of the flow gauging station. The dataset used to train the random forests included the transmission losses derived from the satellite images, the field GPS points and the differential gauging. We will clarify that in the text.

l215 The 'estimated transmission losses vary in time' is unclear. They also vary in space as well as time, so some clarification is needed.

Yes, this is unclear at this stage of the text, we will remove this sentence as this is explained in detail further down.

l224 need to explain where the peak flow that is referred to occurred – presumably this is at the permanent gauging station (clearly a) peak flow is very different when downstream points near the wetting front are considered, and b) there is transmission time for peak flow to propagate downstream)

Yes, we meant the peak flow at the permanent flow gauging station. This will be clarified.

l227 'transmission losses were maximum' is unclear. I assume that what is meant is 'transmission losses estimated using the modelled relationship with flow at the gauging station'. Above, this was described as estimated, but not here?

Yes exactly, we should have use 'estimated' here too. This will be added.

l232 fig 4 caption needs some qualification. These are estimated transmission losses based on the stage at the gauged hydrograph location. (similar comment for Fig 6 caption)

Yes, we will correct that and use 'estimated' consistently throughout the article, including in the figure captions.

Fig C1 shows some sections (below 750m) change from losing to gaining – so complex surface water groundwater interactions

Please see answer to comment on l181.

l314 how could hydrological variability be expected to affect the results? Presumably this relates to groundwater effects? Some thought/discussion is needed, perhaps linking to the observed variability in response shown in App C.

Yes, the groundwater storage in the shallow (perched) aquifer can explain the impact of the hydrological variability on the results. In a dry year, the shallow aquifer will be depleted and not be able to sustain the river flow as much as in a wetter year. We will add some discussion on that in the revised version and cross-sections presenting our perceptual model of the river-aquifer(s) system (as requested by Reviewer 2).

l395 – concluding comments – some thought should be given as to how to further develop insights into the response of this system. It seems to be crying out for some basic monitoring of groundwater. Is there really no data and no monitoring planned?

As mentioned briefly before, this study is part of a larger project aiming at understanding the interactions between braided rivers and groundwater (https://www.researchgate.net/project/Subsurface-Processes-in-Braided-Rivers). Within this project, piezometers have been installed to monitor the pressure and temperature in the shallow and deeper aquifers. We are planning more publications that will focus on these data and the modelling of this river-aquifers system. However, we could include the average and the range of observed values from a few piezometers in this article to support our perceptual model, if this would improve the clarity of the manuscript.

The spelling, wording and typo errors will be corrected in the revised version as you suggested.

Antoine Di Ciacca (on behalf of the co-authors)

References

Larned, S.T., Hicks, D.M., Schmidt, J., Davey, A.J.H., Dey, K., Scarsbrook, M., Arscott, D.B., Woods, R.A., 2008. The Selwyn River of New Zealand: a benchmark system for alluvial plain rivers. River Res. Appl. 24, 1–21. https://doi.org/https://doi.org/10.1002/rra.1054

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