RC1: 'Comment on egusphere-2024-595', Anonymous Referee #1, 13 Jun 2024

RC1-0. This is interesting study because it quantitatively verified Japan's historic river diversion project using a high-resolution global hydrological model and historic data developments. Reconstructing hydrological conditions from centuries ago, when data were scarce, is challenging and contributes not only to validating specific historical events but also to advancing hydrological analysis.

Thank you for your useful evaluation and comments, which will surely improve the overall quality of our manuscript. Below are our replies to your three comments. We hereby hope that you will accept our rationale in your comments and approve the changes that we will make based on your useful suggestions. Should some of the comments still be insufficiently addressed, we will gladly address them in detail at the next revision round based on your further suggestions.

We will reply to the referee comments, with our answer indicated by Answer (in green), corresponding actions indicated by Action (in blue), and textual changes in *italic font*:

RC1-1. One objective of this study is to test the hypothesis from previous studies that the diversion project's purpose was to enhance low flows to maintain the stability of the navigation network. References to other English literature on this project have indicated various interpretations of its purpose, including land reclamation, military defense, and flood protection (e.g., Mushiake, 1988). Although this study tested one of these interpretations, it is questionable whether it is appropriate to draw conclusions about such an important aspect of river history based solely on the results of this study, which focused on a single interpretation. While the quantitative validation is significant, conclusions should be considered with verification for other interpretations of the project.

Our Google searches "Mushiake (or Musiake)", "1988", and "Tone" in various combinations did not show any relevant results in the first 100 entries, so we cannot directly reply to that citation without the exact reference provided. Hereby, we assume that the citation mentions various reasons for conducting the TREDP, as indicated in your comment. We agree with you that there are/were many interpretations of the project.

As for your indication that we might oversimplify the complex background, we take it with gratitude. In revision, we will carefully go through the draft again and modify any oversimplification that was made. Also, we will mention that there are more interpretations regarding the project and reflect this fact in conclusions.

Regarding the latter half of the RC1-1 comment, while we agree that other reasons might also be as important as enhanced river routes for navigation and trading, a very different modelling setup would be needed to test and show the other hypotheses. Testing them would also be a very interesting contribution to a better understanding of the historical hydrology of the rivers in the Kanto Plain, but apparently, they are out of the intended scope of this study.

RC1-2. The bifurcation function is adjusted from 70:30 in the present day to 50:50 in the historical figure, but the validity of this adjustment is unclear. This bifurcation function is crucial in determining the low flow of the divergent rivers. There is a risk that the stability of the low flow/navigation network of past divergent rivers is almost entirely determined by this function. When examining historical events, making such a bold assumption about this critical figure is questionable. At least some cases of this function need to be verified.

Thank you for this comment. We agree with your point that this is an important assumption in our study. First, as we demonstrated in the text, the rate of 70:30 in the present day is reasonable from the viewpoint of river discharge time-series data analysis. As for river discharge 400 years ago, it is hard to know it because there was no quantitative observation left. One thing for sure is that the channel capacity of the Akahori River section, which connects the Edo River (the original southward route) and the Hitachi River (the new eastward route), was much smaller than today; hence most likely less than 70% of river water can travel the Akahori River. We will further justify the rationale of the rate in the revised text. Please note that a relevant sensitivity test has already been conducted, and we confirm that it does not influence our overall conclusions.

RC1-3. The historical river port locations are used as validation data, but the nature, validity, and reliability of this historical data need to be clarified. As the authors indicate, one of the critical contributions and challenges of this study is validating the simulation results in an era without modern river measurements. The reliability of this validation data could determine the significance of this study. Additionally, the process of developing historical data of river channels should be explained in more detail.

Thank you for this suggestion. The nature, validity, and reliability of port location data will be further disclosed in the revised text. In short, the names of ports were taken from historians' books and confirmed by the name of "aza", an administrative designation of small sections into which some of the rural districts of Japan are divided. The old river routes were also taken from figures in books and digitalized to maintain the geometry of routes.

[Nature] The nature of the presented data is from the collective sources of historians, geographers, and other types of researchers who collected and reported those data. We carefully merged these resources and reconstructed our river port locations based on their reports.

[Validity] The validity of our presented river ports data arises from validations of the sources (i.e., ancient documents) who first reported them. Yet, some of them can be validated nowadays using geographical GIS and the name of "aza" mentioned above.

[Reliability] The reliability of our presented river ports data was tested by crosschecking several sources (i.e., books and papers) that reported similar data.

We agree that the process of developing historical data on river channels should be explained in more detail, we will provide clear explanations to precisely clarify the applied reconstruction processes of the historical maps.