Response letter to review comments of the manuscript ‘’*Development of the global hydro-economic model (ECHO-Global version 1.0) for assessing the performance of water management options*’’

Editor:

Dear Dr. Kahil and co-authors,

Thanks for preparing such a thorough revision of your manuscript. I have received reports from all three reviewers. Please consider the minor revisions requested by Reviewer 3. Reviewers 1 and 2 were satisfied with the edits you already provided.

Thanks,

Tom

Dear Editor,

Foremost, we would like to thank you and the reviewers for handling our manuscript and providing thoughtful comments throughout the review process that have helped us to improve substantially the quality of the paper. We have now responded to the comments of the referee #3. The revisions we have made are highlighted in the text and our responses to the referee's comments can be found below.

Best Regards,

Taher Kahil on behalf of authors

Referee #3:

General Assessment of the Revised Manuscript:

I would like to sincerely thank the authors for their thoughtful and comprehensive responses to my previous comments. It is clear that great effort has been made to carefully address nearly all of the points raised, both in the revised manuscript and in the accompanying point-by-point response. I greatly appreciate the authors' diligence in revising the text, figures, and explanations related to the model structure, parameters, and scenario assumptions.

The revised version of the manuscript reads much more clearly and cohesively, and I believe it is now in very good shape for publication as a model description paper in GMD. The improvements have significantly enhanced the transparency of the study, especially for readers who may be unfamiliar with certain modeling or economic concepts. I commend the authors for their extensive revisions and for their commitment to scientific clarity.

That said, I would like to respectfully request that the authors revisit a few remaining (previously major but now minor) issues related to my previous comments. These are relatively minor points, and I leave it to the authors' discretion to determine whether and how to address them, depending on necessity or feasibility. However, I believe that addressing them, where possible, would further improve the manuscript's precision and consistency.

We are pleased to know that our revision was acceptable to you. Thank you for your thoughtful additional comments. We have now addressed them. The revisions we have made are highlighted in the text and our responses to the comments can be found below.

1. Major Comment 2: While the revised manuscript now includes an explanation of how initial reservoir storage levels are given, it still lacks any reference to dead storage in the text. If dead storage is assumed to be zero in the current version of the model, this assumption should be also clearly stated in the text.

Thank you for your comment. We have now indicated in the revised manuscript that dead storage is assumed to be zero, in the absence, to our knowledge, of available global data or references on this parameter. We found only one study of Zhao et al. (GMD, 2024), included now in the reference list, which uses the same assumption of minimum reservoir storage equal to zero. Nevertheless, this parameter can be easily adjusted in ECHO-Global, especially when the model is applied to specific basins where data on reservoir features and operations might be available.

2. Major Comment 4: The addition of the discussion regarding the Ricardian rent principle is appreciated. However, it would be preferable to cite a relevant reference or source that supports this economic assumption, to enhance transparency for readers unfamiliar with the concept.

In the ECHO-Global model, we use a variant of the PMP procedure developed by Dagnino and Ward (2012) to calibrate the model to replicate observed land and water allocations in the reference year. This PMP variant assumes that crop yield is a decreasing function of the amount of land in production. This assumption is consistent with the Ricardian theory of rent indicating how the price of land is determined based on its fertility and location, leading to differences in rent across different parcels of land. This theory has been developed in 1817 by economist David Ricardo. In our paper, we would like to refer readers to the study of Dagnino and Ward (2012) that developed the variant PMP procedure and provided a clear demonstration of it.

3. Major Comment 18: The revision helpfully clarifies which components are included in the phrase “a combination of water management options.” However, specifically, “limiting the use of non-renewable groundwater can help satisfy the demand” still feels somewhat counterintuitive to me. If the intention is to suggest that such a constraint indirectly enables demand satisfaction by encouraging the adoption of other demand management options (as described in the DM scenario), then this causality could be clarified. Otherwise, limiting a water supply source seems to act more as just a constraint (as the authors also mention in the text) rather than as a facilitator in satisfying demand. In the authors’ own explanation, it is the demand management options that directly serve to satisfy the water demand.

To avoid misunderstanding, especially in a scientific context, I would suggest rephrasing the sentence along the following lines. I hope the authors will consider revisiting this sentence to ensure the intended message is as precise and interpretable as possible.

“A combination of water management options (including improving irrigation efficiency and optimizing land and water demand allocation, even with limiting use of non-renewable groundwater) can reduce the water demand to help satisfy the demand.”

Thank you for this suggestion. We agree with it and we have rephrased the indicated sentence as suggested.