

We sincerely thank the reviewers for their time spent reviewing this manuscript and their thorough and valuable comments. Since many comments overlap and some contradict, we decided to upload a general answer addressing the major concerns. We agree to address the line-by-line and detailed comments, which concern minor textual updates.

The current paper is a resubmission of the original manuscript ([original submission](#)), which received two anonymous reviews, extensive feedback from the editor, and a community comment. We addressed all comments even though we believe several of these comments were ambiguous, and the community comment resulted from a conflict of interest that we have now reported to the editorial board. The revised manuscript and present resubmission therefore already incorporated responses to four very different perspectives, with the reviewer's comments answered in the discussion of the previous submission and the response to the Editor's comments ([response to Editor](#)). The resubmission received public comments from the same individual, which are addressed separately, and four additional reviews, combined here. Taking into account the reports of the previous submission, some opinions are substantially repeated and others completely opposed. We will do our best to reconcile the total of nine viewpoints throughout this review process, and synthesize our planned actions below, relative to the four new reviewer comments (R1, R2, R3, R4) along with the context of the full process.

This manuscript is inherently **interdisciplinary**, and we are grateful that several reviewers explicitly recognize the scientific contribution of doing so. It intentionally bridges crop modeling and land surface modeling, which is essential and timely. Some reviewers evaluate the work from their own disciplinary experience, which leads to highly valuable scientific criticism in some cases, and in others to requests that, while reasonable from one perspective, would compromise the scientific purpose of the comparison in the other. Demonstrating differences between a crop model and a land surface model is central to the relevance of this work. Harmonizing every parameter to eliminate differences would defeat the purpose of comparing distinct model philosophies. We strongly maintain that we carefully combine unique expertise in both modelling worlds and that the model intercomparison is set up in a way that truly best respects both modeling frameworks.

In the new revised manuscript, we will incorporate the following improvements, which were consistently suggested across reviewers:

1. First, we will **better position the research question** [R4], clarifying in the "Introduction" (paragraph 2) that estimating irrigation from models and remote sensing has become a shared objective across hydrology, agricultural water management, and land atmosphere research. We will more clearly articulate the purpose of regional irrigation estimation, particularly its importance for water demand assessments, planning, and land surface atmosphere feedbacks. We will

also note that modeled net irrigation can be translated to gross withdrawals if needed for specific applications (paragraph 4 of the “Introduction”).

2. We will further **expand the discussion of uncertainties in satellite-based retrievals** [R1]. Despite addressing this topic thoroughly after the first submission, we recognize the merit in strengthening two aspects specifically emphasized by the reviewer. These are the mismatch between surface soil moisture observations and root zone soil moisture processes that are relevant for irrigation triggering, and the uncertainties introduced by downscaling techniques, which propagate into the evaluation. These additions will be introduced in the Section on “Uncertainty in satellite-based retrievals over irrigated areas”, and this will improve the transparency and interpretation of the benchmarking datasets.
3. Multiple reviewers requested **a clearer description of the in-situ irrigation dataset** [R2, R4]. We agree and will provide additional detail on how these measurements were collected, what crops were present on monitored fields where known, and related uncertainties. We will also clarify their demonstrated value by citing peer-reviewed studies that rely on the same data and clarify that it is trustworthy. The text will be updated in the “Data and Methods” (Section “Irrigation”) and in the “Discussion” (Section “Uncertainty and scarcity of in situ irrigation data”).
4. Finally, we will **strengthen the conclusions** [R1, R4], **offering concrete and practical guidance for both modeling communities**. Specifically, we will discuss the implications of vegetation representation, irrigation triggering assumptions, and the strong influence of meteorological forcing on simulated water use. These points directly reflect reviewer concerns. The text will be updated in Section “Model limitations and potential improvements” and in the “Conclusions”.

Some comments, while scientifically interesting, fall outside the scope of this comparative study and would fundamentally change its intent, and will thus not be implemented, for reasons given below:

1. We will not rerun AquaCrop with a different crop type such as maize, nor modify crop phenology, rooting depth dynamics, or soil hydraulic assumptions [R3]. Such choices would remove the conceptual differences we aim to investigate. For example, Noah-MP is simply not wired to take a specific crop such as maize.

Likewise, we prefer not to alter the temporal aggregation approach [R1]. Although event scale metrics are important for irrigation scheduling, daily timing accuracy is neither expected from these mechanistic models nor relevant to the overarching goals of the work. Evaluation for different aggregation levels is however presented in the “Field-based evaluation” section.

2. We will not alter the structure and level of detail in the paper, because it results directly from integrating extensive revisions requested in the first review round, and we believe it is appropriate for an interdisciplinary audience. We respectfully disagree with the assessment that the manuscript is too long or difficult.

In addition to the major concerns discussed above, we will selectively incorporate the minor comments where they clearly improve clarity, but from our analysis, they will not modify the scientific framing or the results.

We truly value the reviewers engagement. Their careful reading and emphasis on scientific rigor have improved the clarity and impact of this work. We have carefully reflected on and synthesized all feedback and we will improve the contextualization, transparency, and interpretation of the study, while maintaining the scientific integrity of this timely model comparison at the interface of crop and land surface modeling communities.