The article aims to simulate irrigation over the Po Valley using two distinct models, AquaCrop and Noah-MP, and to compare the results against in situ and satellite-based reference data. While the authors evaluate irrigation and related variables (e.g., evapotranspiration, soil moisture, and vegetation) from both models, the results and the robustness of the reference data are not convincing. These shortcomings significantly diminish the scientific value and overall justification of the study. Below, I explain some other major issues:

Scientific contribution is not clear: I don't see the scientific contribution of comparing irrigation simulations from two models, AquaCrop and Noah-MP – both of which rely on inherent assumptions and default parameters. Both models simulate irrigation based on a fundamental assumption: they replenish the soil water reservoir when it drops below a predefined threshold. Given this shared principle, the rationale for comparing two models that essentially simulate "optimal irrigation" for a generic cropland is unclear. Irrigation is an inherently anthropogenic and complex process, influenced by numerous factors such as crop type, soil properties, climate, and irrigation practices. Consequently, observations (e.g., vegetation indices, optical/thermal data, and soil moisture) are crucial for estimating actual irrigation practices. However, the study does not explain how its findings contribute to advancing the understanding of these complexities. Without a compelling rationale or clear outcomes, the study's scientific contribution to irrigation modeling in the Po Valley is undermined.

Reference data and uncertainties: The reference datasets used for model evaluation, such as downscaled soil moisture data from SMAP and evapotranspiration data from SenET, have significant uncertainties and errors. I believe these data are not robust enough to serve as reliable benchmarks. Additionally, by averaging these datasets (both reference data and simulated results from the two models) over two-week intervals, the study further smooths out uncertainties, masking potential differences between the models. The study fails to acknowledge the limitations of these reference datasets or address how they affect the validity of the results. Consequently, the conclusions drawn from the comparisons are not meaningful, as the averaged uncertainties obscure critical insights into model performance.

Generic crop assumptions in AquaCrop: AquaCrop is specifically designed to simulate irrigation for individual crop types, making it a powerful tool for analyzing crop-specific water requirements. However, the study opts to use a generic crop configuration without providing sufficient justification for this choice. This decision limits the insights that could have been gained from AquaCrop's application. By failing to account for the specific irrigation needs of different crops, the study overlooks the diversity of agricultural practices in the Po Valley and fails to reflect the variability of irrigation requirements in the region.

Lack of justification for parameterization: The article does not adequately justify the soil and vegetation parameterization used in both models. AquaCrop and Noah-MP rely on distinct assumptions and input parameters to simulate irrigation, yet the study does not explain the rationale behind the selected parameter values. For example, critical parameters such as soil moisture at field capacity and wilting point, which control the soil water reservoir and thus irrigation needs, differ significantly between the two models in this study. These discrepancies make the comparison less meaningful, as differences in

simulated irrigation may arise from parameter inconsistencies rather than from the models' inherent capabilities. The absence of a clear explanation for these parameter choices raises doubts about the reliability of the reported results.

On the basis of the above considerations, I believe the contribution of the study is not well addressed and the novelty is not well justified for what I believe the paper can't be considered for the publication.