

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1
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Comment on hess-2021-631

Anonymous Referee #1

Referee comment on "Net irrigation requirement under different climate scenarios using AquaCrop over Europe" by Louise Busschaert et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-631-RC1>, 2022

The article 'Net irrigation requirement under different climate scenarios using Aquacrop over Europe' quantifies the current net irrigation and the future variations under different climate change scenarios for a single crop all over Europe. The topic has great potential, and it is particularly up to date and interesting to be analyzed, however, some hypotheses and limitations strongly affect the potential of the results here presented. The major concerns are related to the choice of a unique crop type to be simulated all around Europe. Even if a strong statistical analysis is beyond the reported calculation, it is completely missing how the choice of this crop type is significative for Europe. Are C3 the most widespread crops in Europe? Similarly, in the method it is not clearly stated on which areas the calculation has been computed. Secondly, the spatial resolution of the analysis is coarse, since some global assessment of water for irrigation works at 10km at the equator and maps of harvested areas are available at a resolution up to 250m or even 30m. I furtherly suggest that these works are seen and cited in the article (Liu et al., 2010; Siebert and Doll, 2010, Chiarelli et al., 2020).

Third, some strong assumptions are related to crop characteristic and growing period. While only one crop has been selected, results are reported for only the three summer months, when it could be expected that in future more water is needed even outside the summer months. Furtherly, farmers can adopt different techniques, shifting to different crops or even adapting the planting and harvesting period accordingly to the new climatic condition. This latter option is not mentioned in the paper, neither discussed, while it could greatly influence the reported results.

The quite lengthy description of the statistical analyses obfuscates the main outcomes of the paper regarding the variation in the irrigation demand, potentially distracting the reader from the most interesting results. I suggest moving some of the analysis as supplementary material for better highlighting the effects of climate change scenarios in the different regions of Europe

Other minor comments are reported below.

In conclusion, while believing such analysis can be of great interest, I suggest a major revision of the article is needed before considering it for publications, mainly aimed to improve the representativeness of the simulations.

Suggested references:

Liu, J., & Yang, H. (2010). Spatially explicit assessment of global consumptive water uses in cropland: Green and blue water. *Journal of Hydrology*, 384(3-4), 187-197.

Siebert, S., & Döll, P. (2010). Quantifying blue and green virtual water contents in global crop production as well as potential production losses without irrigation. *Journal of Hydrology*, 384(3-4), 198-217.

Chiarelli, D. D., Passera, C., Rosa, L., Davis, K. F., D'Odorico, P., & Rulli, M. C. (2020). The green and blue crop water requirement WATNEEDS model and its global gridded outputs. *Scientific data*, 7(1), 1-9.

Teluguntla, P., Thenkabail, P. S., Xiong, J., Gumma, M. K., Giri, C., Milesi, C., ... & Yadav, K. (2015). Global Cropland Area Database (GCAD) derived from remote sensing in support of food security in the twenty-first century: current achievements and future possibilities.

Minor comments

Line 110 Please, better state which can be the advantages of the results your presented in this paper

Line 127. 1m of soil depth is your assumption?

Method: on which areas has the model run?

Line 194. Your hypothesis?

Line 208. Is the volumetric content an average on the entire pixel? Is this comparable with the result of a single crop?

Line 234. How are initial simulation conditions set?

Results. Are you referring to consumptive water use or water withdrawals?