

Interactive comment on “Mediterranean irrigation under climate change: more efficient irrigation needed to compensate increases in irrigation water requirements” by M. Fader et al.

Anonymous Referee #2

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The paper gives a good overview of current and future conditions of water availability, climate, population, and water needs for agriculture in the Mediterranean region. It reports on comprehensive simulations to study the interactions among climate change, irrigation improvements, and irrigation water requirements in the Mediterranean region. The paper is generally well-organized and uses logical methodologies. It provides reasonable conclusions while acknowledging the strengths and weaknesses of the analysis. The following comments and suggestions are given to improve the clarity and quality of the paper. The comments/suggestions refer to specific page (P) and line (L) numbers in the submitted manuscript.

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Scientific questions/issues: P8466, L13: References are given for more details of crop parameterization. However, this paper should briefly describe or mention the general approach of how LPJmL simulates plant responses to changing CO₂ concentrations. This information is important because this paper gives results of simulations of yield responses to several CO₂ scenarios. Does the model mechanistically simulate stomatal control of CO₂ assimilation and effects of CO₂ concentration on photosynthesis? How does the model handle differences between C3 and C4 species (e.g., What parameters are used to differentiate their responses to CO₂)?

P8467, L19: 90% of field capacity as a trigger for irrigation is relatively high. Is this equivalent to just 10% management allowable depletion (MAD)? Most crops can tolerate 30% to 60% MAD, without experiencing water stress. The 90% of field capacity would probably require very frequent irrigations. Please give the rationale for using a relatively high value for triggering irrigations.

P8467, L23: It is not clear how atmospheric demand (D) or potential evapotranspiration is estimated. Is an energy balance approach used, or a combination method (e.g., Penman-Monteith equation)? Also, is rainfall considered in the calculation of D? Conceptually, the NIR should account for any effective rainfall that satisfies part or all of the atmospheric demand.

P8468, L4: Please give the data source for WHC values.

P8470, L10-11: The sentence is fragmented and unclear. Please rephrase.

P8502, Figure 5: In the figure title, please indicate what sub-figures a, b, and c are showing.

Technical corrections:

P8464, L27: Change “revised literature” to “reviewed literature”. P8464, L29: Spell out “FACE” (Free Air CO₂ Enrichment), for readers who are unfamiliar with this acronym. P8466, L17: Change “consist in climate” to “consist of climate”. P8466, L21: Spell out

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“CRU” to clarify the meaning of this acronym. P8467, L8: Change “same than the” to “same as the”. P8467, L15: Change “trajectories for every of these” to “trajectories for all of these”. P8468, L1: The assumption of maximum transpirational rate if the soil is saturated seems to be flawed. Saturation indicates water-logged conditions that would be detrimental to most crops that need aerated roots. Should this be “field capacity” instead? P8473, L16: Change “when regarding to” to “when considering”. P8473, L17: Change “oppose to” to “opposed to”. P8473, L22: Change “influence” to “influenced”. P8474, L27: Change “CGM” to “GCMs”. P8475, L17: Change “overcompensate” to “exceed”. P8476, L18: Change “20180s” to “2080s”. P8477, L7: Change “aggregated after” to “aggregated for”. P8478, L6: Delete “coincides”. P8480, L10: Change “overcompensate” to “offset”. P8481, L12: Change “6” to “Six”. P8481, L17: Change “strongest” to “strongly”. P8482, L16: Change “Despites” to “Despite”. P8482, L17: Check the year (2014) for the Elliot et al. reference. Should it be 2013? P8483, L18: Change “counterpart” to “counteract”. P8484, L20: Delete “of” before 20C. P8486, L18: Define or spell out “COP”. P8487, L28: Change “an” to “a”. P8488, L1: Change “phosphor” to “phosphorus”. P8488, L5: Change “have” to “has”. P8488, L23: Change “values” to “value”. Change “crop choices rather on water productivity” to “crop choices on water productivity rather”. P8489, L24: Change “being” to “making”. P8490, L7: Change “this” to “these”.

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