

Earth Syst. Dynam. Discuss., referee comment RC2
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Comment on esd-2021-9

Anonymous Referee #2

Referee comment on "Downscaling of climate change scenarios for a high-resolution, site-specific assessment of drought stress risk for two viticultural regions with heterogeneous landscapes" by Marco Hofmann et al., Earth Syst. Dynam. Discuss., <https://doi.org/10.5194/esd-2021-9-RC2>, 2021

Comments on "Downscaling of climate change scenarios for a high resolution, site-specific assessment of drought stress risk for two viticultural regions with heterogeneous landscapes" by Hofmann et al.

Overall, this paper represents an advancement in our knowledge of the impact of climate change on viticulture albeit in this case for two very specific regions in Germany. Specifically, the authors incorporate site specific soil information into a vineyard water balance model to assess drought stress against the backdrop of climate change. I recommend acceptance subject to the following revisions.

Major Concerns:

1. While the paper focuses on drought stress, I strongly urge the authors to consider heat stress as well. They have all the information at hand, so it should be relatively straight forward to consider in tandem both drought and heat stress. Moreover, the authors should go into more detail as to what specifically is driving ET changes in the future. Right now the description is rather vague between temperature and solar radiation.

- There is no consideration of the importance of rooting depth on the water balance calculation. I see this as a potential serious deficiency. Given the wide range of soil types and the lack of irrigation, what is the range of root depths across the region? How sensitive are the calculations to vine age/rooting depth? At a minimum a sensitivity analysis should be performed for a realistic range of root depths and not just some average value.

Specific comments.

1.Lines, 20, 79, 86, etc. Why were the Rheingau and Hessische Bergstrasse chosen for this study? I can understand the Rheingau as one of the world's most renowned wine regions, but why Hessische Bergstrasse versus say the Mosel, the Pfalz or the Nahe? The reasoning as stated is not very convincing.

- Line 50, canopy management is mentioned in passing here as a possible mitigation for climate change but never really followed up in the discussion at the end.
- Please elaborate in more detail on issues with respect to access to water (e.g. the steep slopes) and water restrictions (e.g., appellation constraints).
- Line 86. There should be a fuller discussion as to the limits and uncertainties of downscaling at this scale.
- Line 107, what region?
- Page 4, bottom. Of the 10 weather stations considered, how many unique 25km RCM grid boxes are used?
- Line 160, it is not clear at all why the annual mean global temperature of MAGICC is used and not the annual mean global temperature of the GCM climate change projections?
- Section 2.4: Again what is the sensitivity of these results as a function of root depth resulting from vine age, soil type, and site-specific water availability? What is the range of root depths across the region?
- Section 2.5: There is a missed opportunity here to also consider heat stress sensitivity when you have all the data at hand to so.
- Section 3. The paper would benefit from more discussion at the end as to non-stationarity.
- Lines 232-33. Per 10 above, what does this sentence mean? Why are extreme events underestimated?
- Figure 2. Please show a power spectrum of the 30-year results not just the seasonal cycle and whisker plots.
- Line 287. Please replace this and all subsequent uses of the word bandwidth. The most common use of bandwidth refers to a frequency range, for example when filtering a time series. Spread or range are much better.
- Lines 320-325, please detail what is driving these ET changes.
- Much like 13, please describe in greater detail what is mean by "ensemble change"
- Line 429, please tease out what is driving ET
- Line 435, all the more reason to also include heat stress in this study not just drought stress

- Line 501, please also discuss the potential role of canopy management